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THE AGRICULTURAL GAZETTE OF CANADA

Vol. IX May-June, 1922 No. 3

LEADING TOPICS

Experimental Station, Kentville, N.S.
Mosquito Breeding Places
Fruit Growing in Canada
Dietary Value of Milk
Potato Certification
Agricultural Instruction in Nova Scotia and Manitoba
School Fairs and Home Gardens, Ontario

STORAGE

DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

The Agricultural Gazette of Canada is published bi-monthly, in English and in French, by the Dominion Department of Agriculture, Ottawa.

The aim of The Agricultural Gazette is to provide a source of information as to the policies and activities of the Dominion Department of Agriculture and of the Provincial Departments of Agriculture and of Education, so far as the work of the latter relates to Agricultural Education. Besides being a publicity medium, it constitutes a comprehensive record of the progress and development of departmental effort on behalf of Agriculture in Canada.

The Agricultural Gazette is not intended for general distribution. It it sent free to agricultural workers and teachers, including school teachers who have agricultural teaching qualifications; to members of parliament; to libraries; to the Press, and, as an exchange, to institutions in other parts of the Empire and in foreign countries.

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
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The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

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OTTAWA

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MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

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The AGRICULTURAL GAZETTE
OF CANADA

VOL. IX MAY-JUNE, 1922 No. 3

DOMINION EXPERIMENTAL FARMS

THE EXPERIMENTAL STATION, KENTVILLE, N.S.

BY W. S. BLAIR, SUPERINTENDENT

THE placing of an Experimental Station at Kentville, Nova Scotia, grew out of an agitation on the part of the Nova Scotia Fruit Growers' Association for a fruit experimental farm in the Annapolis Valley. The earliest educational activities of the above association resulted in the opening of a horticultural school at Wolfville, N.S., and they were assisted in this undertaking by the Provincial Department of Agriculture. This school later became a part of the Nova Scotia Agricultural College, Truro, and its removal from Wolfville was agreed to on the understanding that a fruit experimental farm be established in its place. This agreement was carried out and a part of the present experimental farm was purchased by the Nova Scotia Government, its selection being largely left to a committee appointed by the Nova Scotia Fruit Growers' Association, of which R. S. Eaton, Esquire, Kentville, was chairman and the most active in bringing about the location of the station at Kentville. The following year, 1911, this farm was taken over by the Federal Department of Agriculture and made a part of the Experimental Farms System. Active work was commenced in the spring of 1912 under the direction of the present superintendent.

The original farm was 294 acres and to this was added 7 acres of woodland, making 301 acres, which for the most part was uncleared and included a broken ravine of approximately 125 acres. This ravine is too rough to be of any agricultural value, but is desirable as a wooded park area. The area actually cleared from green forest amounts to 127 acres, all of which is now devoted to fruit or farm crops. The balance of the farm, some 49 acres, was more or less cleared when the purchase was made. In 1920 an adjoining farm of 130 acres was purchased and used as a training farm for returned men. This area included 18 acres of bearing orchard, 11·5 acres of dyked lands, 20·5 acres of cultivated land and 80 acres of unbroken pasture land and woods, 15 acres of which has since been cleared. An area of 21 acres situated between the two farms has been secured under lease with option of purchase, which when brought about will give a total connected farm area of 452 acres. This area for the most part is situated within the boundary of the town of Kentville and the entrance to the farm is one mile from the railway station.

The surface soil of the farm is for the most part a sandy loam and has a subsoil ranging from that of a generally well-drained formation to a clay which prevents ready drainage. For experimental work it is found that these clay areas require underdrainage, and some 12 acres have been so treated. The farm purchased in 1920 has much more clay subsoil than the original farm and considerable areas will require underdrainage for the most effective experimental work.

The buildings on the early purchased station property have all been constructed since its inception and include the superintendent's residence, one single and one double cottage. There are two cattle barns, one horse barn and an implement shed as the principal farm buildings. In addition are the dairy building and ice-house, piggery and two smaller buildings for young stock. The poultry equipment consists of a main service building, breeding house of 12 pens, two 100-hen houses, eight colony houses and five brooder houses. The property purchased in 1920 had a dwelling house and several buildings, and the latter buildings have been converted into one stable, capable of storing feed and housing thirty to forty head of steers.

The orchard planted since 1912 amounts to 47 acres, which with the mature orchard purchased later makes 65 acres in tree fruits. The plantings include: apples, 227 varieties, 2,616 trees; pears, 55 varieties, 223 trees; plums, 92 varieties, 367 trees; cherries, 54 varieties, 154 trees; peaches, 47 varieties, 106 trees; apricots and quinces, 12 varieties, 23 trees. This makes a total of 3,489 trees established since the farm was started and includes 487 varieties. These orchards are now coming into fruiting and information relative to the value of the different sorts grown is being secured. Particularly interesting is the collection of English varieties of apples, most of which have fruited, and none of which seems to be of more vaue than those now generally grown. Spraying experiments and tests with different fertilizers on orchard trees are being carried on. Other tests, including thinning of fruit, pruning and cultivating, are being conducted.

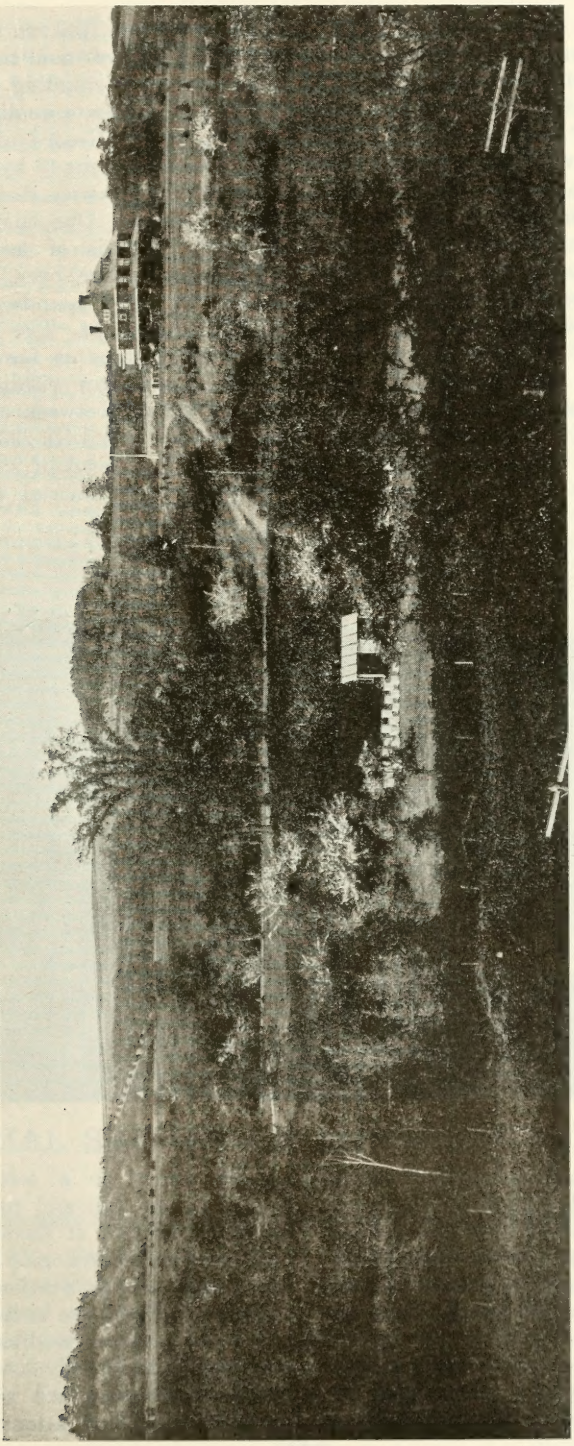
The relative cost of spraying and dusting, and the efficiency of insecticides and fungicides when used as a dust or in the form of spray for the control of insects and diseases is one of the problems studied. The results as indicated below were secured by dusting and spraying one acre of 40 trees, twenty-five years old, three times in 1921.

	Bordeaux Dust	Sulphur Dust	4-8-40 Bordeaux Arsenate	Lime Sulphur 16-40 Arsenate
Materials used	216 lbs.	246 lbs.	780 gal.	780 gal.
Time to apply	45 min.	45 min.	5¼ hrs.	5¼ hrs.
Cost of material	$12 96	$17 22	$14 19	$10 14
Cost of application	60	60	4 20	4 20
Total cost	$13 56	$17 82	$18 39	$14 34

Three applications were made of spray and dust and the cost of application is charged at the rate of 80 cents per hour. The results from five applications of dust are also given. The efficiency of the sprays and dust for scab control as determined from the fruit picked in 1921 was as follows from Gravenstein and McIntosh Red,—

	Cost per Acre	Per Cent Scab Gr.	Per Cent Scab McI.
Bordeaux dust, 3 applications, 2 before and one after bloom	$13 56	24	..
Sulphur dust, 3 applications, 2 before and one after bloom	17 82	19	..
Bordeaux spray, 4-8-40, 2 before bloom and lime sulphur 1 to 40 after	16 91	6.4	9.0
Lime sulphur 1 to 40, 2 before and one after bloom	14 34	3.5	12.0
Bordeaux dust, 5 applications, 3 before and 2 after bloom	22 60	8.0	..
Check, not sprayed	.....	37.0	..

Small fruits have been grown in considerable areas and include trials with strawberries and bush and cane fruits, thus furnishing information of value concerning their culture. Vegetables are included in the horticultural tests and information of value to those interested in these crops is secured. The orna-

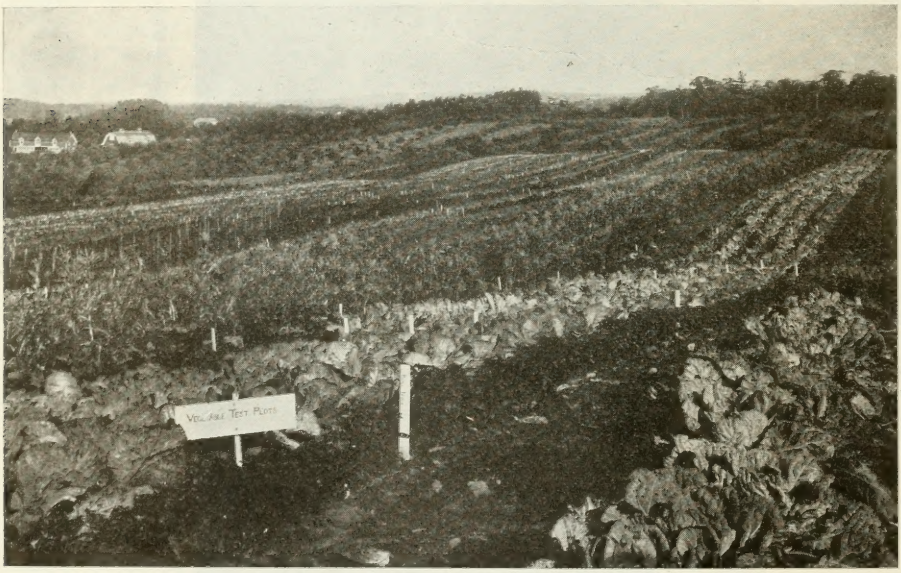


Experimental Station, Kentville, N.S.—General View.

mental plantings are a striking feature at the Station, and much aid is given to those interested in this phase of horticulture. Potatoes are largely grown in the Annapolis Valley district for export to Havana. Consequently considerable attention has been given to this crop in an experimental way, to determine the best varieties and methods of culture likely to give the largest returns. The importance of rotation and planting on clover sod has been demonstrated, and an effort to produce disease-free seed for distribution has been fairly successful.

While the Station was primarily intended for horticultural investigational work, yet because of the large stock raising and general farming interests in the district served, a herd of Shorthorn cattle has been established, and general farm crops have been grown. The Shorthorn herd at present consists of 61 head of dual-purpose animals conducted under the accredited herd plan of the Health of Animals Branch of the Department of Agriculture. This stock is cared for as a dairy herd having in view increased milk production, but at the same time maintaining beef qualities that would give them good standing as beef producers. The aim is to qualify as many as possible in the Record of Performance class, and at present 13 have so qualified, 2 having passed twice, 2 three times and one five times. One cow has a record of 10,864 pounds of milk; four over 8,000 pounds; five over 7,000 pounds; seven over 6,000 pounds and seventeen over 5,000 pounds. The rule in breeding is to produce as far as possible, a calf from each cow within the year, but the actual time between calving periods has been 387 days with 293 milking days.

Twenty-four head of steers are being fed in an experimental way, there being six steers to a test. These are bought in the fall and turned off in a finished condition at Easter. There are four pairs of draft horses and two driving horses at the Station. A limited number of Yorkshire swine are kept in order to supply breeding stock for farmers. Barred Plymouth Rock and White Wyandotte are the breeds of fowls carried, and attention has been



Experimental Station—Vegetable Test Plots

directed toward increased egg production by trap nesting and breeding from the most productive birds.

During the past two years it has been possible to produce the hay required for the stock, and an average of over 200 tons of corn silage has been grown. The climatic conditions are particularly suitable for corn, and it has been one of the most satisfactory silage crops. Mangels and turnips amounting to 5,000 bushels annually are also grown. The area in oats during the past season was limited, and because of dry weather the yield was light, but in 1920 the yield was over 2,000 bushels and ranged from 46 to 74 bushels per acre.

Because of large quantities of fertilizer being used on orchard and field crops throughout Western Nova Scotia, extensive experiments with fertilizers are being carried on, there being nearly 400 test plots comprising 25 acres. Experiments with ground limestone have been given special attention, and these tests have revealed great gains from its use, particularly in obtaining large clover yields and bringing in fields of low fertility. Soils generally in this section are deficient in lime and more or less acid, which accounts in a large measure for poor hay yields, and it has been shown by tests covering several years that two tons of ground limestone applied every three or four years when seeding to clover will double the yields of clover hay and greatly improve conditions for future crops. Tests covering a period of six years show a net increase of $93.13 per acre in value of crop in the limed area over that not limed but otherwise similarly treated, an annual gain of $15.52 per acre. The average annual cost for this gain was $2.80 per acre per year. Plots 25 and 32 were manured at the rate of 15 tons per acre in 1916 and 1919, and on plot 32 two tons of limestone per acre was applied in 1916 and 1919.

Fertilizer	1916 Potatoes Bushels	1917 Wheat Bushels	1918 Hay Pounds	1919 Potatoes Bushels	1920 Wheat Bushels	1921 Hay Pounds
Manured and limed	228	21	4,155	347	29	3,180
Manured	211	13½	1,575	289	18	1,360
Gain	17	7½	2,580	58	11	1,820

Because of fruit growers being greatly benefited through bees pollinating orchards, an effort has been made to encourage the beekeeping industry. Some 60 colonies are kept, and experiments covering their management and wintering are being carried on. It has been found that on an average a colony will produce 100 pounds of extracted honey per year if reasonable attention is given to its management.

AN AERIAL SURVEY OF MOSQUITO BREEDING PLACES

BY ERIC HEARLE, DOMINION ENTOMOLOGICAL BRANCH

DURING 1921, the Canadian Air Board co-operated with, and rendered signal assistance to, the Dominion Entomological Branch in a study of mosquito breeding areas in the Lower Fraser Valley of British Columbia.

For a number of years requests had been made for an intensive study of the mosquitoes of the district, as it was known that certain of the species affect all outdoor activities. Fruit picking has been hampered; lumber camps were forced to close down; considerable losses

had been incurred in the dairy sections through the drop in milk production, etc. The enjoyment of beautiful summer days is certainly clouded by the scourge of these winged insects that irritate so effectively.

The investigation embracing 2,000 square miles of affected territory was commenced in 1919. The first season was spent in a survey to ascertain the mosquito fauna of the district, and the area was thoroughly scouted over by means of an automobile. The second season was mainly devoted to a study of the factors determining mosquito abundance, and of the two species constituting the pest—the flood water mosquitoes—*Aedes aldrichi* and *Aedes vexans*. In order to study these under natural conditions a motor boat and canoe were utilized to penetrate the depths of the huge cottonwood flood swamps, that are the main breeding places. Work of special importance in 1921 has been the mapping of the breeding areas and it is in connection with such work that aerial surveys have proved of the utmost value. Those who were in the raid zone during zeppelin activities may remember that ornamental ponds were drained dry in the cities, because they stood out so clearly as to act as guides to the raiders. The mosquito hordes, which raid the houses, woods and fields of the Lower Fraser Valley in restless search of blood of humans and of cattle, have had this lesson of zeppelin days applied against them; and their breeding places—temporary flood water swamps—stand out clear and distinct to the view of those in the cockpit of an aeroplane. The first step in attacking the mosquito pest—the mapping of the breeding areas—is thus made possible and is accomplished with ease.

Nicomen Islands—Flood conditions.

By arrangement with the Air Board one of the seaplanes of the Vancouver station was on occasions sent to Hatzic

Lake in response to a telephone call. What we desired to obtain was a series of photographs and observations of the more important breeding areas under different flood conditions—one at a river level of about 17 feet 6 inches (under which no infestation materializes); and one at a river level 19 feet (extensive floodings at very high levels are almost invariably followed by a serious outbreak of mosquitoes.)

For the best results in aerial photography certain conditions are necessary. The visibility must be good—that is, the atmosphere must be clear and devoid of blue haze or smoke; the day should be cloudless—the shadows of clouds on the earth's surface give a patchy mosaic, and the passage of thunder clouds causes the atmosphere to be so "pockety" that a level, even course is hard to maintain. For the best results in the work we had planned it was necessary for the right river level and satisfactory weather conditions to coincide.

Fortunately the river reached a level of about 17 feet 6 inches during weather conditions almost perfect for aerial photography; and on May 28 the seaplane C.Y.B.B., piloted by Mr. W. H. Brown, flew over the entire valley, using Hatzic Lake as the base. Mr. C. J. Duncan, the station photographer, obtained a splendid series of mosaics and obliques that included practically all the important breeding areas from Hope to Vancouver. The writer directed the taking of these and during the flight obtained extensive notes on flood conditions, vegetation, etc., in the individual breeding places. Several breeding areas, which had not before been located were noted. In the morning three hours flying covered the upper end of the valley. Much of this time was spent in attaining height, as the photographic work was done at over 7,000 feet. During the afternoon an hour's flight back to the Jericho station gave all the data needed at the lower end of the valley. In a total of four hours' flying time we obtained data covering all the flood water breeding areas in a territory of some 2,000 square miles. It was essential to obtain this data all in one day, on account of the fluctuation of the river level. Imagine the army of surveyors and the expenditure needed to obtain this information by any other means than by aerial survey.

Two days prior to our flight rain had washed the air clean of the minute particles of dust and smoke, and the atmosphere was vividly clear and splendid visibility obtained. The valley lay under us, flattened out at that height to resemble a huge map with every field and detail distinct and clear-cut. The contrast in colour between bare fields and those green with growing crops is greatly accentuated by distance, and the effect in well developed sections is that of a patchwork quilt of many shades. Yellow is especially noticeable and clumps of buttercups stood out with amazing distinctness. Water was so clearly seen that even the smallest of pools could be picked out with ease, and no difficulty was experienced in noting the encroachment of flood water.

On June 12, the seaplane C.Y.B.B. was again sent from Vancouver to pick up the writer at Hatzic Lake—on this occasion Mr. McLeod was the pilot. The river had reached its peak—21 feet 4 inches, and the weather man had again been obliging enough to supply conditions of excellent visibility. A further series of observations and photographs were obtained showing the greatly increased expanses of flood water. The Nicomen Island dykes had given way only a few hours before and a great deal of the island was already under water and provided a most desolate looking spectacle. While we did not obtain as extensive a series of photographs as in the previous flight, careful notes covering every breeding place of importance gave sufficient data to prepare a map indicating those areas upon the reclamation of which depends the control of the mosquito pest. From these observation flights we would esti-

mate that at a river level of about 21 feet there are in the valley approximately 28 thousand acres of temporary flood-water breeding areas of a suitable nature for the production of vast numbers of mosquitoes (of the two species, *Aedes aldrichi* and *Aedes vexans*). The potentialities of such an acreage are hard to imagine, especially in the light of some of our experiments to determine the numbers of mosquitoes in limited areas. By actual count we found 3,218 fertile eggs in one square foot of sod cut from the edge of a meadow subject to flooding. Were all the flooded areas in the valley evenly infested at this rate (which fortunately is not the case) the mosquito population would run into 13 figures.

The results of last year's surveys have proved one way in which the aeroplane may be of great value in entomological practice. The writer believes that it is his privilege to have been the first to utilize the aeroplane in Canadian entomological observations. The first attempt in this connection was made in August, 1919, when Lieut. G. K. Trimm of the Vancouver Aerial League made a landing at Chilliwack on his way to the interior. The writer happened to be passing through Chilliwack at the same time, and persuaded Lieut. Trimm to take him over the Chilliwack, Sumas and Nicomen areas. A few photographs were obtained with a small camera and useful notes were made as to the breeding places in the district. The conclusions from this flight are noted in an article by Dr. C. G. Hewitt.[1] In 1920 and 1921, the Division of Forest Insects of the Entomological Branch

Aerial oblique of Harrison bay district, B.C.

(1) The use of the Aeroplane in Entomological Work. G. C. Hewitt, *Agr. Gaz. of Canada*, Vol. VI, No. 10, Oct., 1919.

carried on extensive forest surveys in Northern Ontario and Quebec in connection with a study of spruce budworm injuries. The results of the earlier surveys are dealt with in an article by Dr. J. M. Swaine.[2] Entomological surveys of this nature can undoubtedly be accomplished with greater economy of time and money when undertaken with the aid of an aeroplane, than by the old labourious methods of ground survey parties.

COMMERCIAL FRUIT GROWING IN CANADA

From an Address delivered at the Annual Meeting of the American Pomological Society

BY C. W. BAXTER, COMMISSIONER, FRUIT BRANCH

IN taking up the subject of Commercial Fruit Growing in Canada, I shall refer briefly to conditions during the past few years, present conditions and the future outlook. Three classes of fruit are grown commercially in Canada—first, apples, second, tender fruits, third, small fruits, which include strawberries, raspberries, currants, and gooseberries.

Apples

As the distance between our eastern coast and the Pacific coast apple-producing provinces is approximately 3,000 miles, it is quite natural that there should be considerable variation in growing conditions and in the fruit. I think therefore that the situation will be better understood if each province be dealt with separately. Commencing at the Atlantic coast we have in the Province of Nova Scotia, the Annapolis and Cornwallis valleys—better known perhaps as "The Land of Evangeline"—where apple growing is carried on to a greater extent than any other branch of agriculture. These valleys are especially adapted to the growing of this fruit, and the close proximity to seaboard offers special advantages to the export markets of the United Kingdom and the Continent of Europe. In 1911, as the result of increased efforts on the part of the growers and exceptionally favourable weather conditions, Nova Scotia produced a crop of approximately 2,000,000 barrels, a record which has not since been reached.

During the Great War, as we know, there were many things affecting the fruit industry which were very discouraging to fruit growers. Fruit was considered a luxury and a non-essential and, while other branches of agriculture were being encouraged by increased demand and correspondingly increased prices, the difficulties to fruit growers were increased and the export markets were closed to fruit. As Nova Scotia had for many years exported the greater part of her crop to the United Kingdom and did not have a home trade connection with other provinces in Canada, these discouragements were felt more in that province than in any other. The placing of an embargo on the importation of fruit into the United Kingdom resulted in an almost total neglect of orchards in some provinces, but the growers in Nova Scotia, notwithstanding the discouraging outlook, continued to care for their orchards with the result that they have had good, average crops during the past three years of approximately 1,300,000 barrels of commercial fruit. A large percentage of the crop is marketed co-operatively. In one co-operative association there are between 1,700 and

(2). A Survey of our Forests from the Air. J. M. Swaine, *Agr. Gaz., Canada*, Vol. VII, No. 1, Jan., 1921.

1,800 members, representing about 40 per cent of the growers of the province. This I think is one of the most efficient and most economical distributing organizations on this continent.

The St. John River valley, in the adjoining province of New Brunswick, is especially adapted to the growing of some of the best hardy varieties, including McIntosh Red and Fameuse. This province, at the Imperial Fruit Show held recently in London, England, was awarded first prize in the "All Canadian" competitive section for both these varieties. The quantity has not yet been sufficient to supply the needs of the province but, as a railway has recently been constructed, formerly known as the St. John Valley Railway but now owned and operated by the Canadian National Railway system, we are confidently looking forward to this valley becoming one of the best apple producing districts in the Maritime Provinces. The commercial apple crop of New Brunswick in 1919 was 40,000 barrels and in 1920 was 30,000 barrels. The 1921 crop has been estimated at 33,000 barrels.

The province of Prince Edward Island which, as you know, is situated in the Gulf of St. Lawrence and separated from the Mainland by the Northumberland Straits, is not a great factor in the commercial apple crop, and a large portion of the fruit consumed is brought in from the adjoining provinces. It has, however, been demonstrated that the hardier varieties can be successfully grown there. This province is specially adapted to the growing of small fruits but, on account of the difficulties of transportation, fruit growing has not made any great progress during the past thirty years. With the improved railway transportation now in operation it is expected that fruit growing in that province will be greatly increased in a few years.

Leaving the Maritime Province and travelling West about 800 miles, we come to the principal apple producing districts of the Province of Quebec, where the Fameuse and the McIntosh Red varieties are grown to perfection. This province was unfortunate in losing a large portion of the Fameuse trees, and many trees of the other varieties, as the result of the unusually severe winter of 1917-18 but, notwithstanding this severe loss, the growers are not discouraged, and these orchards are being re-established. The demand for the Quebec grown Fameuse and McIntosh Red in the province of Quebec is such that the highest price paid for any variety has been obtained, and it has not yet been necessary for the growers to look outside their own province for a market.

The province of Ontario, which is one of the oldest apple growing provinces in Canada, and which up to a few years ago produced the greatest quantity, also suffered from the severe winter of 1917-18 and a number of the trees were killed. Had the fruit growers of Ontario followed the practice of the growers in Nova Scotia and continued to care for their orchards during the war years, prior to 1917, the loss from the severe weather would undoubtedly have been less. This province during the past three years produced the following commercial crops: in 1919,—879,000 barrels, 1920,—1,600,000 barrels, and the estimate for 1921 is 960,000 barrels.

Unlike the provinces of Nova Scotia and British Columbia, where apple growing is a specialized industry, the bulk of the apples in Ontario are grown on mixed farms and, on account of the higher prices paid of late for other farm products, the farmer fruit-grower has not been giving much attention to orcharding. However, now that prices of these products have been greatly reduced in contrast to the slight reduction in the price of apples, there is a greater interest being taken in orcharding. While the process may be slow, nevertheless we expect that apple growing will in the near future be carried on as a specialized in-

dustry in Ontario as it is in the other provinces referred to.

In the Prairie Provinces, apple growing is not carried on in a commercial way, and our next and last commercial apple-growing province is British Columbia on the Pacific Coast. This province produced last year 4,000 cars of apples or approximately 3,000,000 boxes. This is about 100 per cent more than in 1920. The increase is largely the result of the increased growth of the trees recently come into commercial bearing. The growers in British Columbia, like the growers in the Northwestern States, have been compelled to adopt co-operative marketing. This province has now one of the most efficient co-operative marketing organizations in Canada, and has established an excellent reputation for reliable grading and packing in both the home and export markets. During the past year the distribution has been greatly widened.

Markets and Marketing

This will give some idea as to the conditions in the commercial apple-growing provinces in Canada at the present time, but in order to form a definite opinion as to the outlook it is necessary that we review the marketing conditions during the past few years. It will be remembered that in 1912 the United States and Canada had one of the biggest apple crops on record and the returns to the growers, generally speaking, were very discouraging. The conclusion reached by many was that there had been overplanting, and this conclusion was strengthened by the fact that there had been extensive planting in the Northwestern States and in British Columbia, and when these plantings came into bearing the price of apples would be so low that it would not pay to care for the orchards. Planting, therefore, practically ceased in 1911, and many orchards were neglected. In 1914 we had another big crop, and when the fruit was ready to harvest, the markets were completely disorganized as the result of war conditions. Having regard to these facts, and also to the great loss of trees from the unusually long and severe cold during the winter of 1917-18, we are of the opinion that even under the most favourable growing conditions our maximum commercial apple production cannot exceed our greatest production of twenty-five years ago.

The supply of some agricultural products may be increased or decreased in one or two years, but with apples this cannot be done as the plantings of to-day represent the crop of several years hence, and the law of average is again asserting itself. To-day, although the prices of many agricultural products have materially declined, the price of the best varieties and grades of fruit is being substantially maintained. I therefore feel that the outlook for commercial apple growing in Canada was never better, providing that we profit by our past experience and plant only such varieties as the market requires and which succeed best in the particular district. We are not convinced that we have at any time reached the stage of over-production but that our discouragements, especially in 1912, were due to lack of organized marketing facilities. The large cities and towns were oversupplied, while the smaller consuming centres—and we have many of them in Canada—were receiving a very small proportion of what they might consume. I am at the same time convinced that if we are to avoid a repetition of the unsatisfactory conditions met with in 1912 and preceding years, we must develop an efficient co-operative marketing organization in proportion to our increased production. Unless this is done, the industry will be unbalanced. In fact we are so firmly convinced that our future success is dependent on centralized co-operative marketing that we hesitate to organize more independent fruit growers' associations in Ontario until the independent associations now in existence have established a central co-operative

marketing organization. We fully expect that this will be accomplished before another crop is ready to market.

Tender Fruit

In regard to the growing of tender fruit in Canada, I may say that while pears and plums are grown in all the commercial apple-producing provinces, a very large percentage of the total crop is produced in the province of Ontario and in the Okanagan valley in British Columbia. With regard to peaches, the history of commercial peach growing in Canada has convinced us that the area in which this fruit can be grown with any degree of safety from winter killing is confined to the Niagara peninsula in Ontario and the southern parts of the Okanagan valley in British Columbia. There are a few more districts in Ontario where peaches are grown, but the quantity can have very little effect on the market. Therefore, with efficient marketing facilities provided, peach growing in the districts named should be a very profitable branch of fruit growing. The same conditions would apply to the commercial growing of grapes, although British Columbia has not yet produced any great quantity of these.

Small Fruits

Small fruits, such as strawberries, raspberries, currants, and gooseberries, like pears and plums, are grown in all commercial apple producing provinces, but the greater portion of the total crop is grown in Ontario. In the eastern provinces of Quebec, New Brunswick, Nova Scotia, and Prince Edward Island strawberries form the major portion of the small fruit crop, the bulk of which is, as a rule, sold within the province. For several years prior to 1910, the prices received by growers were not satisfactory, and it was difficult at that time to obtain sufficient help to harvest the crop, due principally to the exodus of our people to the Prairie provinces. The result was that the acreage in 1911 was considerably reduced, and as labour difficulties continued and were increased during the war years, there was a further reduction in acreage. The demand, however, continued firm and there was a steady advance in prices, which probably reached the peak in 1919 and 1920. Notwithstanding the advance in prices, it was not until the labour situation improved in 1919 that growers were able to increase the acreage to any extent. In 1919 and 1920 the acreage was greatly increased, especially on the Lower Mainland and on Vancouver Island, B.C., where a number of ex-service men have taken up small fruit growing with considerable success under government assistance. During the past season the price of strawberries and some other small fruit declined, but the decline would not have been so pronounced had the jam and canning factories been able to handle even a small portion of their annual purchases. There has been a decided improvement in the marketing facilities for handling the small fruits during the past season, and we are confidently expecting that this branch of the industry can, with profit, be considerably extended.

THE DIETARY VALUE OF MILK

BY MISS HELEN G. CAMPBELL, DAIRY AND COLD STORAGE BRANCH

CANADA is distinctly an agricultural country and dairying is one of the biggest branches of Canadian agriculture. From the standpoint of health, it is safe to say that there is no branch of work in Canada outside the field of medicine which has as great a bearing on the health of the people as the dairy industry. The health, wealth, usefulness, and civiliza-

tion of any nation or any people depend largely upon the food of its people, and the dairy provides its share of food for Canadians, and a food of the highest order.

Besides the food value of dairy produce, which we shall consider later, the accessibility of this group of foods is a strong point in their favour. The dairy cow lives anywhere in Canada and will carry on her mission as a food producer in every part of every province. Human nutrition has advanced very greatly within the last few years and investigations which have been made on this subject have placed milk and dairy products, such as butter, cheese, skimmed milk, buttermilk, etc., in a more favourable light than at any other time. In fact, the man who has perhaps done more along this line than any other man in North America is so impressed with the food value of milk and its products and with the importance of the dairy industry that he devotes much of his time telling the people about it and doing everything in his power to promote dairying. This man is Dr. McCollum, who has performed so many experiments in his laboratories in Johns Hopkins University, and who is among the best known authorities on nutrition both in this country and in the old land. Many of his earlier experiments in this science were performed to determine the value and comparative values of certain foodstuffs such as corn, wheat, etc., in the feeding of animals. Later, most of his experiments were performed to find out the food value of various foods in human nutrition.

It is necessary to know the constituents of available foods in order to make a wise choice as to quality and quantity for the human body at different stages of growth and at different ages. No other subject is to-day of more vital interest than the welfare of the child, and no phase of this question is more important than proper food. The lack of wisely chosen foods in childhood may be a very serious stumbling block in the power of the child and a great handicap in after life.

The body is made up of cells which form the different parts of the body, such as bone, muscle, blood, etc. From the food we eat, the body gets the material for the formation of new tissues and for the upkeep or repair of the tissues. There is one constituent of food which serves this purpose, and foods which contain it take first rank among the foods. This substance is called protein, and it is found in eggs, meats, cereals, legumes, fish and in milk and most milk products. All proteins, however, have not the same value; some foods supply protein of greater physiological use than that supplied by other foods. Experiments show that when protein from cereals is the only protein in the diet of growing animals, the body of the animal is able to use only about 30 per cent, but when milk is the only source, the body can make use of as high as 65 per cent. Furthermore, when an animal is fed both cereal and milk protein in combination, it can use all the milk protein and a much higher per cent of the cereal protein. It is easy to translate this into every day life. For instance, if we give a child cereal alone, only a small percentage will really be used to do its special work in the body, but if we add milk generously, not only will the milk proteins be of the greatest value, but a much higher per cent of the protein contained in the cereal. This is true of such staple combinations as bread and milk, oatmeal and milk, rice and milk, etc., and, although these foods have long ago proven their worth, we have only recently understood the real reason of the importance of the combination. It is partly for this reason Dr. McCollum calls milk a "protective food,"—because the deficiencies of other foods are made good by milk in the diet. Eggs and green vegetables are also designated by this term, "protective foods," but milk stands at the top in the opinion of those who are in the best

position to know. It becomes apparent then that milk supplies the very best kind of body-building substances and supplements those supplied by other foods.

The quality of the mineral matter in milk is another reason for its importance in the diet. There are many kinds of mineral matter in our foods, but the chief and most necessary ones are lime, phosphorus and iron. It is this substance which gives rigidity to the bones and teeth, and the child cannot have a strong frame or a healthy body without a sufficient amount in his food. Milk is the chief and cheapest source of lime and not only is it present in whole milk, but in skim-milk, buttermilk, cheese and all milk products, with the exception of butter. The mixed diet is often deficient in mineral matter and by far the most practical and safest way to be sure that the child will have all he needs is to give him plenty of those foods. Phosphorus is also abundant and the need of the body for this substance will be met by a liberal use of milk. Though milk has not a great deal of iron, the amount it contains is of excellent quality and this mineral is common among the vegetables and fruits.

The body needs another constituent in food which it can convert into energy for the body to do its work. The sugar in milk helps to do this, as does also the fat contained in it. Commercially, the fat is the most important and, when milk is bought and sold, usually the price is regulated by the percentage of butter fat it contains. Butter fat has always been recognized as good food and is now looked upon as more or less a standard of value.

But lately cream is known to have another somewhat mysterious value, because of certain substances it contains about which very little is as yet known. The name "Vitamine" was first given to this indispensable substance by a Polish investigator. Dr. McCollum, by his work, proved that there were at least three kinds of vitamines. These he prefers to designate by the non-committal names of Fat Soluble A, Water Soluble B, and Water Soluble C.

As the name implies, the Fat Soluble factor is closely associated with the fats in certain foods, and it is known to be contained in large amounts in butter fat. Professor Sherman says "there is no substitute for fat" in a child's diet, because it contains this indispensable substance, without which, normal, physical growth, or proper mental development is impossible. The fat in eggs and in certain vegetables contains this also, but other fats used as food, such as lard and vegetable oils, are without it. Butter fat is not the only fat containing it; cod liver oil is rich in this vitamine, but cod liver oil is not used in this country as a food. Beef suet contains some, but in insufficient amounts for the needs of the body. Butter fat, therefore, is almost indispensable in the diet of children.

But the fat soluble factor is not the only one necessary; the water soluble vitamine must be included and here again milk assures an adequate supply. Water Soluble B, as well as the third one, Water Soluble C, is much more abundant among our common foods and, as long as a mixed diet is in favour, there is little danger that Canadian people will suffer from diseases which result from an insufficient supply. Eastern people, living largely on rice, suffer from a disease called beri beri, which can be corrected at once by an improved diet containing Water Soluble B. Scurvy used to be the plague of those taking long voyages, and green fruits and vegetables are a safeguard against it, because they contain the Water Soluble C or anti-scorbutic factor. Milk will also correct this disorder and, though it is lower in this anti-scorbutic quality, it is doubly important if the supply of vegetables and fruits is limited. It can be easily understood then how important is clean, fresh milk for babies and children.

Vitamines are not made in the body. The supply must come in the first place from the leaves of plants. If we could eat sufficient green leaves, there would be assured an adequate amount, but our digestive organs could not take care of the amount necessary. Here the cow steps into the breach. She is the most important food factory in the world and nothing made by man can equal the cow in the amount of food material produced, in territory, in efficiency and in economy. A cow eats enormous quantities of green leaves, grass, hay, etc. She will consume 40 or 50 pounds per day and give, say, 10 quarts of milk. That is to say, as Dr. North puts it, for each 4 pounds of green feed, she gives one quart of milk, so that this amount of milk contains the extract of about 4 pounds of green leaves. The cow needs a certain amount for her own body, but the surplus she puts in her milk. Is she not a wonderful laboratory, equipped by nature to concentrate the best of the leaf into a food for human beings. When we realize her importance, we will treat her with more respect, care and intelligence. She gives us good food and, if in good health, she is prepared to give us this food in a sterile, absolutely clean condition. We must admit that we do not always do our share in keeping the milk of the same first-class quality in which we receive it. Are we as particular as possible to keep the milk free from contamination? Do we use covered milk pails, do we clean and curry our cows and wash their udders before milking? Do we milk only with clean hands, clean clothes and in a clean place? Do we take pains to cool the milk as rapidly as possible and keep it cold? Bacteria and disease germs find milk a fine food as well as we do and it is the best medium for their growth. If germs were big and dark as black cats, we would avoid them, but because they are so small that they cannot be seen, we prefer to trust to luck that they are not there. We can at least keep milk clean and, if we are not absolutely sure of the source of our milk supply, the health of the animals and the persons handling it, we can pasteurize it and make it safer without taking away from the food value of the milk.

How many dairymen are really vitally interested in selling the best milk rather than just milk? Perhaps some day we will have refrigerator cars for transporting milk and, when the millenium dawns, we can count on it that among the chief foods will be clean, fresh, properly handled, pure milk and the foods that are made from it.

The Government of Canada is well aware of the importance of the industry. The Dairy Commissioner, Mr. Ruddick, anxious to serve the public in the best way and, being fully alive to the value of dairy produce as a good food, decided to add to his staff an official whose chief duty it would be to disseminate information on this subject in any way suitable or in any way desired by the people. In this Mr. Ruddick had the support of the heads of the department. To me has been given the privilege of carrying on this work, and I wish to say that in whatever way I can co-operate with any organization or any individual, I shall be happy to do so.

POTATO INSPECTION AND CERTIFICATION

BY GEORGE PARTRIDGE, DIVISION OF BOTANY, CENTRAL EXPERIMENTAL FARM

DURING 1921 this work was conducted along lines similar to those of previous years, with the exception that, it having been found advisable to disregard for certification purposes all fields that failed to come within the standard set for qualification as Grade No. 1, the grade formerly known as No. 2 was abolished. This was followed up by a second field inspection just before maturity (the first inspection being made at the time the plants are in bloom) of all fields which came well within the No. 1 standard at the time the first inspection was made. Although this procedure entailed the covering of most of the seed-growing districts twice during the growing season, an opportunity was thereby afforded the inspectors of deciding whether any element of doubt, which may have existed with regard to the classification of some fields upon the first inspection, was justified or not. It is satisfactory to note that in the large majority of cases the favourable conditions obtaining earlier in the season were fully maintained throughout the growing period.

A considerable extension of territory was included in the year's activities. The provinces of Saskatchewan and Alberta, where in 1920 only a limited survey was made, were more generally surveyed, and a number of fields submitted for inspection. Many of these being found worthy of consideration for seed purposes, the growers were encouraged to submit their crops for certification, a considerable amount being accordingly certified to. It is hoped that a further extension of the work in these two provinces will be possible during next season.

The total number of fields inspected throughout the country was 2,646, containing an acreage of 7,900. Of these, 1,634 fields containing 4,290 acres passed the two field inspections, an average of 61·7 and 58·7 respectively. The amount certified to up to the time winter brought the work to a conclusion in some of the provinces, was approximately 310,000 bushels. When in the spring it is possible to complete the certification of the 1921 crops, this amount will be considerably increased.

Following will be found a tabulation of the work by provinces:—

	No. of fields inspected	No. of fields passed	Acreage inspected	Acreage passed
Prince Edward Island	285	178	963	541
Nova Scotia	184	121	276	208
New Brunswick	254	172	951	639
Quebec	1,131	520	4,106	1,726
Ontario	218	176	486	431
Manitoba	404	367	613	520
Saskatchewan	88	38	374	159
Alberta	82	62	131	66
Total	2,646	1,634	7,900	4,290

The following table gives a comparison between the results of the field inspection of 1920 and 1921—the provinces being placed in order of merit, calculated from the results of 1921:—

Province	1920			1921		
	Acreage inspected	Acreage passed No. 1	% passed No. 1	Acreage inspected	Acreage passed No. 1	% passed No. 1
Ontario	472	256	54·2	486	431	88·6
Manitoba	594	275	46·3	613	520	84·8
Nova Scotia	379	298	78·6	276	208	75·4
New Brunswick	1,413	661	46·8	951	639	67·2
Prince Edward Island	886	523	59·0	963	541	56·2
Alberta	.....	.....	.....	131	66	50·4
Saskatchewan	.....	.....	.....	374	159	42·3
Quebec	3,868	837	21·7	4,106	1,726	42·0

As a result of the analysis of our records for the purpose of making this comparison, we are in a position to state that the very satisfactory increase in the percentage of acres which passed inspection during 1921 may be attributed to the employment of improved methods of seed growing and to the more general use of certified seed. This feature is particularly outstanding in Ontario, Manitoba and Quebec, where the percentage increased from 54·2 to 88·6, from 46·3 to 84·8 and from 21·7 to 42·0, respectively. In Manitoba especially, a large quantity of certified seed from Northern Ontario and Minnesota was judiciously distributed and submitted for inspection. Had the weather conditions been more propitious during the earlier part of the season, the results would have undoubtedly been still more gratifying.

In New Brunswick, where considerable difficulty has been experienced during the past few years owing to the prevalence of Mosaic among the Green Mountain variety of potatoes in some districts, special emphasis was placed by the inspectors upon the importance of rogueing the fields in those districts where conditions do not appear so favourable for the production of this trouble. Rogueing was not advocated in fields where Mosaic was present to the extent of more than 5 per cent, but following the introduction of certified seed, in which the amount of Mosaic present was infinitesimal, into some of the potato-growing districts along the North Shore of the province, followed by a thorough rogueing of the fields in 1920 and 1921, a valuable seed crop was produced in the latter year, a large amount of which was quickly purchased by growers from the United States who had surveyed the fields during the season. There is still a considerable quantity of this stock available, and as it was chiefly responsible for raising New Brunswick's percentage from 46·8 to 67·2, no opportunity is lost of recommending its multiplication within the province.

In Nova Scotia the percentage of fields passing inspection was not quite so high as in 1920. There was apparently no increase in the amount of disease present, the abnormally hot, dry season being responsible for indifferent growth in some districts. An unfortunate occurrence of wilt in a number of fields in Prince Edward Island late in the season somewhat reduced the percentage passing inspection. Great enthusiasm on the question of seed potato production has been aroused in this province during the past two or three years, due to the efforts of the inspection service and the officials of the Potato Growers' Association, and the occurrence of wilt was the only factor preventing a far better showing. As previously noted, inspection was conducted in Saskatchewan and Alberta for the first time in 1921. therefore no comparison can be made However, the past year's results may be considered very promising.

Owing to the vast territory covered by this work, and in which many and varied climatic and soil conditions prevail, it has been found preferable not to adopt permanent standards, but for the

sake of uniformity to revise them year by year should such conditions render revision advisable. The standards adopted for 1921 were as detailed below:—

FIELD INSPECTION STANDARDS

Certified No. 1 Grade Seed Potatoes, 1921

Black-leg	3%
Curly Dwarf and Leaf Roll	2%
Mosaic	2%
Wilts	3%
Foreign	1%
Misses	Not taken into consideration

(1) If Black leg and Wilt are present alone 7% allowed.
If Black-leg and Wilt are present combined 7% allowed.

(2) If Leaf Roll and Mosaic are present alone 5% allowed.
If Leaf Roll and Mosaic are present combined 5% allowed.

(3) If a percentage of (1) and a percentage of (2) are present 6% allowed.

TUBER INSPECTION STANDARDS

Bacterial Rot or Wilt	2%
Late Blight and Dry Rot	3%
Net Necrosis	3%
Internal Spotting	3%
Common Scab (occasional spots)	10%
Common Scab, severe	1%
Powdery Scab	1%
Rhizoctonia (occasional spots)	10%
Rhizoctonia, severe	5%
Silver Scurf	3%
Slightly damaged	2%
Foreign	1%
Frost injury	No allowance
Off Type	2%

No. 1 Grade seed potatoes shall not be less than three ounces nor more than twelve ounces in weight, and shall not contain more than a total of five per cent of all diseases with the exception of slight common scab or rhizoctonia, for which an additional five per cent is allowed, and shall not contain a higher percentage of damaged and foreign tubers than is provided for in the standards.

In classifying the fields inspected, we are guided to some extent by the standards and current reports. Owing, however, to the difficulty experienced in some years and during certain periods in almost any year, in recognizing the presence of such diseases as Mosaic and Leaf Roll, it is felt that anyone not thoroughly acquainted with the inspection system might consider that if classification is based entirely upon current reports, sufficient precaution against possible non-recognition of these diseases is not provided for. It may therefore be stated that at the headquarters of the work, a special card system is maintained which contains the history and behaviour of hundreds of lots of seed inspected year by year, together with their origin. By this means it is possible to trace the history of such seed for several years back, which often results in the rejection of a field, even though a current report may be favourable; the right being reserved to base the classification not only upon present status, but more so upon past history in so far as Mosaic and Leaf Roll are concerned. Experience has made us realize that a system of potato inspection not taking into consideration the record which certain strains have previously made, will not afford such an exclusive guarantee of freedom from systemic diseases as is possible by the method outlined.

A gratifying feature of potato inspection and certification is the continued eagerness on the part of growers across the border to procure seed potatoes certified to under the system. During the fall of the past year sixty carloads were consigned in that direction from Prince Edward Island and thirty-four carloads from New Brunswick, at prices well in advance of those obtainable for ordinary uninspected stock, and quite acceptable to the producers. A profitable business is becoming established, which promises to materially increase in volume within the next few years.

The work was conducted as usual with the valued co-operation and assistance of the officials of the various provincial Departments of Agriculture, who in several instances place the services of trained and experienced men at our disposal during the periods of field work and tuber inspection.

For the coming year it is again proposed to send out forms of application for inspection to all potato growers on our mailing list, inviting them, in the event of their requiring the service of an inspector, to fill in the forms and return them by a given date. Any grow-

ers who have not yet participated in the benefits derivable from this service, and whose names are consequently not on our mailing list, should communicate with the Dominion Botanist, Central Experimental Farm, Ottawa, who will give every attention to such communications.

THE SEED GRAIN PURCHASING COMMISSION

THE Consolidated Balance Sheet of the Seed Grain Purchasing Commission to November 30, 1921, is presented herewith. The profits shown have been approximately sufficient to pay the operating expenses of the Commission and interest on the money while employed by them, so that it may be said that this Commission has not been in any sense a charge on the public funds.

It is of greater importance, however, that, throughout the period of war and since, this division of the Seed Branch has served to protect Canadian agriculture against seed shortage of any of the staple kinds of seed grain. Further, all of the seed grain purchased and sold by the Commission has been on the basis of established grades for seed grain and subject always to inspection certificates, and no seed has been sold that has not been properly tested for purity and vitality. The officers of the Seed Branch who have been employed in this work since 1916 had been in the service of the Seed Branch since 1906.

It is not as a rule expected of civil servants that they will enter into merchandising work of this character and make a financial success of it from year to year, particularly during periods when most private business firms with kindred activities have found it difficult to avoid a debit balance with their yearly operations.

BALANCE SHEET 1916-1921, AS AT NOVEMBER 30, 1921

ASSETS—		
Cash in Bank	$ 244 26	
Accounts Receivable—		
Canadian Pacific Railway Co. *et al* (Freight Rebates)	163 84	
Stock on Hand (Grain and Sacks)	308,645 65	
		$309,053 75
LIABILITIES—		
Advances by Department of Agriculture	$16,171,540 96	
Less Amount refunded to the Receiver General	16,122,169 42	
		49,371 54
Surplus, 1916-1921		$259,682 21

WESTERN RYE GRASS

Greatly Increased Yields Obtained from Recent Selections

THE importance of Western Rye grass to the farmers of Western Canada is comparable to that of timothy in the East, and the fact that this native grass is found in a wild state in a large number of forms makes it a promising species for study by agricultural scientists. The experts of the Dominion Experimental Farms have of late given it more systematic attention than any other grass, and the results that are likely to follow their investiga-

tions promise to be of great practical importance. In his report for 1920-21, Dr. M. O. Malte, until recently the Dominion Agrostologist, announces the discovery that this grass is normally self-fertilized, whereas grasses in general are open-fertilized. The fact that wheat is self-fertilized has made possible the production by scientific breeding of improved varieties such as Marquis. Now that it has been established that Western Rye grass is normally self-fertilized, it will be comparatively easy for the hybridist to originate countless new varieties which will be constant in their characteristics, or in other words, will breed true to type. For this work the plant breeder already has at hand in nature a large number of different types of this grass to work with. By combining and recombining the various characteristics found in them, new varieties can be produced, which will remain constant from one generation to another, and from which selections may be made. In the pursuance of this work a number of wild forms have been collected from practically all of the Provinces. Plots from these were established, with the result that last year some 150 lots of Western Rye grass were being grown at Ottawa for the purpose of studying their relative agricultural value. In 1920, seven varieties were sent for further test on the prairie farms, while in 1921 five additional varieties were sent out to the same farms.

Between these varieties an astonishing difference in yielding power has been already observed. The fact that, in 1920, one gave only 12 pounds 5 ounces of straw and seed from 300 plants, while another produced 109 pounds 5 ounces will indicate the wide range of productiveness. Results for 1921 are not complete, but the difference in yielding capacity of various varieties was even more striking. It is well within the mark to say that the maximum yields were more than five times as great as the yields of varieties commonly grown. Analyses made by the Dominion Chemist to determine the varieties having the highest percentage of nutritive constituents show that the difference in this respect is also very marked. The inference is that by the simple propagation of the high yielding variety and its introduction to agriculture the increase in productiveness of this valuable plant would correspond; and it should be mentioned that one variety which showed up particularly well in 1920 was sown in 1921 in a field plot for seed propagation. The field of cross-breeding has not yet been entered upon, but apart from that, the above facts are in themselves of the greatest significance to western farming.

THE GRIMSBY PRE-COOLING AND EXPERIMENTAL FRUIT STORAGE WAREHOUSE

THE Grimsby Pre-cooling and Experimental Fruit Storage warehouse has been sold to the Growers' Cold Storage and Ice Company, Ltd., Grimsby, Ont., the transfer having been completed on January 31, 1922.

This warehouse was erected in 1914 and has been operated during the intervening years by the Dairy and Cold Storage Branch. It was planned for the purpose of demonstrating the value of the pre-cooling of fruit for immediate shipment, and for the study of the best method of applying refrigeration for this purpose. It also provided facilities for conducting experiments in the cooling and refrigeration of fruits, testing the value of different storage periods at different temperatures, the rate of cooling in different packages, and other similar lines of work, the results of which have been published in bulletin form.

Using the warehouse as a base, experimental shipments were made to dis-

tant markets, and different types of refrigerator cars were tried out. It was in shipments from the Grimsby plant that the suitability of properly filled brine tank cars for the long carriage of tender fruits was first demonstrated in Canada. Growers using the facilities offered at this warehouse have been enabled to extend their markets by shipping tender fruits to much greater distances. Certain varieties of fruit can now be shipped successfully to Winnipeg and other western markets, which formerly had to be disposed of in markets nearer home.

The fruit growers have all learned to appreciate highly the advantage of having a place where tender fruits could be held while a carload was being accumulated, over week ends, and during periods of temporary glut on the market. The warehouse also proved to be a great boon to the canning industry, and indirectly to the producers, who were able to store berries and other fruits for a week or ten days when, owing to weather conditions, they were being delivered in quantities in excess of the capacity of the canning factories. Many thousands of dollars worth of fruits have been saved from complete loss under circumstances of that kind.

The fruit growers of the Grimsby district are so convinced of the absolute necessity of cold storage facilities for the successful handling of tender fruits that a strong company has been organized among them to take over the plant.

The warehouse was originally equipped with what is known as Cooper's Gravity Brine System. At the time it was erected this system had certain advantages, but these have entirely disappeared under the changed conditions since 1914. The new company has equipped the warehouse with mechanical refrigeration and ice-making facilities. The capacity of the warehouse will be practically quadrupled under the new arrangement.

THE ENLARGEMENT OF THE FINCH DAIRY STATION

THE Finch Station, operated by the Dairy and Cold Storage Branch, is being enlarged to take care of the constantly increasing supplies of milk. The station was established in 1912. In that year the total supply of milk received was 2,069,281 pounds. The quantity received in 1921 was 6,586,485 pounds. Part of this increase comes from additional suppliers who have joined the factory since it was first started but the bulk of the increase is due to greater production on the part of the original suppliers. New patrons have not been encouraged to leave surrounding factories except during the winter months when these factories are closed. The Finch Dairy Station is equipped to manufacture cheese or butter and to ship milk or cream according to the demands of the market. It has never been closed for a day since it was started in the spring of 1912. The supply of milk during the winter months is now six times greater than it was at first. The station is operated as a regular commercial factory. Full rates are charged for manufacturing.

Its growth and development shows how the dairying industry is encouraged by good management and by providing the necessary equipment to operate the year round and to turn out the product commanding the highest relative price for the time being.

At the annual meeting of the patrons of the Station, held recently, a motion to authorize the Department to charge higher rates for the manufacture of cheese and butter and the handling of milk and cream was approved without a dissenting voice. It was admitted that the special equipment which enables the management to manufacture butter or cheese or to sell milk or cream at a moment's notice should be recognized in the rates which are charged.

THE SIXTH DOMINION FRUIT CONFERENCE

IN accordance with resolutions passed by the various Provincial Fruit Growers' Associations, the Minister of Agriculture called the Sixth Dominion Fruit Conference to meet in Ottawa, February 22, 23 and 24 last. Of the thirty-two official delegates, twenty represented fruit growers and fruit growers' shipping organizations, while twelve were chosen by the allied industries in the following proportion:—

Wholesale Fruit Trade	6
Package Manufacturers	3
Jam Manufacturers	1
Nurserymen	1
Retailers	1

That the importance of this Conference was appreciated is evidenced by the fact that additional representatives, including members of the Provincial Departments of Agriculture, of fruit growers' organizations and shipping organizations, officers of the railway and express companies, package manufacturers, etc., were present, and far outnumbered the official delegates, so that the attendance throughout the Conference ranged from one hundred to two hundred and over. Mr. C. W. Baxter, Dominion Fruit Commissioner, acted as Chairman.

Practically all the subjects that came up for discussion had been considered at the recent Provincial Annual Meetings, and the delegates were in a position to present the views and recommendations of their respective districts and interests in a comprehensive manner, making it possible to get through a large amount of business. While some of the subjects on the agenda, as for instance the adoption of the Western States grade names for apples in boxes and the change in the size of the berry and currant boxes, were of a somewhat contentious nature, a marked spirit of co-operation and willingness to sacrifice provincial prejudices was apparent throughout the three days' deliberations.

A matter of far-reaching importance to the industry was the proposal to organize a National Horticultural Council, which received unanimous support. The creation of a Dominion Bureau of Markets was also approved. Many transportation problems were dealt with. Considerable attention was given to by-products, the Conference passing a resolution recommending assistance in marketing for the canning and jam industry, asking that the legislation with respect to the manufacture of jams and jellies be more strictly enforced, and that legislation be enacted prohibiting the use of chemicals in the preparation of beverages, such as cider, fruit juices, wines, etc.

The question of grades for tender fruits in open packages was discussed, but no legislation recommended, it being felt that progress could be made by the optional use of grades for a few seasons under the direction of the Fruit Branch. A resolution was introduced urging that the Fruit Branch assist the blueberry industry by giving an inspection service, and many other matters pertaining directly or indirectly to the industry received attention from a Dominion-wide point of view.

CONFERENCE ON THE GRADING OF DAIRY PRODUCE

A conference of dairy interests was held at Ottawa early in March last by the Dominion Dairy and Cold Storage Commissioner, Mr. J. A. Ruddick, to consider the adoption of regulations for the official grading of butter and cheese under the provisions of the Dairy Produce Act of 1921. The Act referred to empowers the Dominion Department of Agriculture to compel the grading of dairy products intended for export, but does not become oper-

ative until such time as regulations in regard thereto have been duly authorized.

The conference included representatives from all the cheese and creamery butter sections of Canada, as well as from producers' organizations, buyers, exporters, provincial and Dominion officials, and others interested in the export of dairy produce.

After discussing the matter in all its bearings, the conference expressed its approval of the adoption of the principle of official grading, leaving it to the Department to draw up such regulations as the circumstances called for.

The Dairy Commissioner submitted to the conference for consideration the definitions and standards for grades of cheese and butter that have been in use in Canada since the conference of 1918. After full discussion by special committees these standards were adopted with slight revision.

The conference formally expressed its appreciation of the opportunity accorded for discussing the various problems connected with the enforcement of the Dairy Produce Act. Grading for export is expected to go into effect about May 1.

COMPOSITION OF STOCK FOODS

THE Seed Commissioner of the Dominion Department of Agriculture, Mr. Geo. H. Clark, states that the adulteration of commercial stock foods is still quite prevalent, making it desirable that care and discrimination be exercised by farmers in purchasing them. While the bulk of the feeds on the market are as represented, there are still far too many that are fraudulent, or are misleadingly named, or contain materials unsuitable for feeding purposes. The following four typical examples are given:—

A feed recently offered for sale as barley meal at $4 a bag was found to contain no barley but to consist of ground corn, sorghum, bean meal and ground oat hulls. "Feed Flour" at $4.50 per bag was found to consist of ground rice hulls, pulverized oat hulls, with some sorghum and corn. "Feed," the kind not specified, was found to consist of ground oat hulls with a vital weed seed content of 1,870 per ounce. "Ground Oil Cake" was found to consist of ground cocoa shells, a little linseed meal and barley flour.

Microscopical examination is necessary to determine the composition of a stock feed, as the naked eye cannot distinguish the materials present, particularly when they are finely ground. The Feeding Stuffs Act, administered by the Branch is intended to stamp out fraudulent practices in this connection and to protect buyers. Samples of feeds that show evidence of adulteration should be forwarded to the Seed Commissioner, Ottawa, together with all possible accurate information. The results, if need be, together with the information supplied, will be promptly issued for the special consideration and action of the inspector for the district where the article was manufactured or imported.

The capacity of the Ottawa feeding stuffs laboratory for the micro-analysis of feeding stuffs is about ten samples per day. The fee is one dollar for each sample examined, and entitles the sender to the analysis for his own information or for court action.

THE DOMINION EDUCATIONAL BUTTER SCORING CONTEST FOR 1922

THE plan of the contest will be the same as that for 1921. It is suggested that the provincial authorities in selecting creameries to take part in the contest should, as far as possible, arrange for creameries, or rather buttermakers, that have not taken part in any of the previous contests to participate.

(1) The contest will cover the period from May to October inclusive.

(2) The sample (a 14-pound box of butter), must be made between the 1st and 15th of each month and shipped by express, charges collect, to the "Dairy and Cold Storage Commissioner, c/o Lovell & Christmas, Montreal, Que.," to arrive on or before the 20th of the month.

(3) The Provincial Dairy Commissioners are asked to select a different creamery each month to participate in the contest and to advise the creameries of the selection. Each creamery participating will send only one sample.

(4) Blank churning record forms and full shipping instructions will be mailed from Ottawa to each creamery participating as soon as the names and addresses are received.

(5) The butter will be scored a few days after arrival in Montreal, and copies of the churning records and scores will be sent to every buttermaker in Canada.

(6) It is presumed that the creameries will be able to procure the 14-pound boxes. If there should be any difficulty in getting them, the Dairy Branch, Ottawa, will furnish them at cost on application.

PART II

Provincial Departments of Agriculture

AGRICULTURAL INSTRUCTION IN NOVA SCOTIA

Particulars of work performed under the Agricultural Instruction Act during the First Nine Years of Operation

BY DR. M. CUMMING, SECRETARY FOR AGRICULTURE

IN each annual report issued since 1912 of the Secretary for Agriculture of the province of Nova Scotia, a somewhat detailed statement has been published dealing with the expenditure under the Dominion Agricultural Instruction Act in that province. Since these reports are all preserved and are easily accessible, we plan in this contribution to give just a brief résumé of the work that has been accomplished by the use of funds provided under that Act, and to refer any who may desire further details to the aforementioned provincial records.

To begin with, the grant has not taken the place of former provincial appropriations for, during the period in which the Agricultural Instruction Act has been in force, the annual provincial expenditure increased from $75,779 in 1911 to $118,162 in 1920, and to $146,390 in 1921, this latter amount including, however, an extraordinary expenditure for the balance of payments in connection with the "Greater Production" campaign of war times. The different expenditures under the Federal appropriations are herewith set forth under the general broad divisions to which they were applied.

The Agricultural College

A relatively large portion of the Agricultural Instruction Act money has been spent to provide for a necessary development in the Agricultural College which, before the grant was given, was a comparatively small and quite inadequately equipped institution. An addition equal in size to the original structure was made to the main building and a new horticultural building with greenhouse was erected at a cost of approximately $50,000, which was paid outright from the grants of 1912 and 1913. In 1914 a Science building was erected and equipped at a cost of $118,000 and since that time interest and sinking fund payments have been made annually. The capital debt now stands at $96,000.

In addition to the foregoing capital expenditures, a sum varying from $20,000 to $24,000 has been annually spent to provide for an increase in the staff of the college as well as to afford further opportunities and facilities for work. Four new heads of departments with assistants were appointed, so that to-day the institution is well equipped and well balanced, and is recognized in the three Maritime Provinces from which students come, as offering as good facilities for work as any agricultural college in Canada.

It may be considered by some that the spending of such a considerable proportion of the grant on this central institution is not entirely within the intention of the Act. But if any one entertains this view, it should be answered that, under the conditions prevailing, where the territory is relatively small and the instruction con-

fined to a two-year course, the members of the staff are engaged in extension work to almost as great an extent as in the purely centralized college work. This has been made possible by relieving for extension work, men who were formerly tied down practically all their time to routine college work. The facts are that the result of this development, made possible through the Agricultural Instruction Act appropriation, is a more efficient college which has become a vital factor in every branch of general agricultural development in the province.

Dairying

The Dairy Division of the Provincial Department of Agriculture was organized after the passing of the Agricultural Instruction Act, and the major part of the current expenditure of this division has been paid out of the grant. When the division was formed in 1912, organized dairying in Nova Scotia was a very small business. The total output of butter from the then existing factories was less than 200,000 pounds. Last year it was over 3,000,000 pounds, and while this large increase was not all due to the departmental staff, still those who are conversant with the situation recognize that the Superintendent of Dairying and his assistants have been large factors in this development. If there is any one line in which the Agricultural Instruction Act has outstandingly scored in the province of Nova Scotia, it is in respect to the assistance it has given to the development of dairying.

County Representatives

The Agricultural Representative branch has also been organized since the Act came into force and paid for entirely from funds provided under this Act. To date, however, the work has not been developed to as great an extent as have some of the other programmes. Five representatives have been employed each season on an average, and the services of others have been engaged for shorter intervals to carry out specific objects. Apart from general organization work, some of the special lines in respect to which tangible results are now forthcoming in those counties where representatives have operated, have been the growing of clover seed, the dipping of sheep, the spraying of potatoes, the growing of turnips in certain communities where the value of this crop and the most expeditious methods of cultivation were not realized, the demonstration of methods of using various fertilizers, the organization of communities to take advantage of established creameries, and the organization of a considerable measure of co-operation in buying and to a lesser extent in selling. One feature which any one might have anticipated has been clearly demonstrated, namely, that the individuality of the representative counts for more than the system under which he works. It is hoped that this branch of agricultural activity will be more strongly developed in future years.

Poultry

The greater part of the expenditure in connection with poultry improvement has been assumed by the Provincial Department, but definite lines of work have been carried on through the use of the grant. Twenty-five demonstration poultry houses were erected in various localities on a basis of the department supplying the plans and paying for the material, the parties on whose property the houses were erected supplying the labour. This worked out on a basis of about 60 per cent from the department and 40 per cent for the party on whose property the building was erected. Under an agreement, each building was vested in the private owner, the condition being that he must maintain a good flock and permit visitors to inspect the building.

Co-operative egg marketing was facilitated in several communities, although, it must be stated, with lesser success than has been the case in provinces where local markets are not so easily accessible. The expenses of practically all the educational meetings held in the interests of poultry improvement have been paid for out of this fund, as well as those of organizing a provincial poultry association and the incidental annual cost of carrying on this organization. For several years, eggs from pure-bred poultry were supplied to school children at a nominal cost, and in this way good poultry stock was distributed in many localities and the interest of many youths in poultry raising established. During the present year a two weeks' short course in poultry at Truro and a two days' course at Sydney were paid for, in the main, out of this appropriation. Altogether, a big return has been given to the province from that part of the grant devoted to poultry improvement.

Soils, Crops and Drainage

Prior to the funds provided under the Agricultural Instruction Act being available, the college at Truro had only the partial use of a chemical laboratory at the Provincial Normal College, with the result that little work of a systematic character was done in respect to soil studies. However, when the Act placed at our command increased funds, a chemist and later an assistant were added to the staff, and when the Science building was completed, excellent facilities were placed at their disposal for carrying out a comprehensive programme. The following are some of the more important lines of work attempted, all being financed out of the Federal grant:—

(1) A fairly complete soil survey of the province was made, including a chemical and physical analysis of several hundred representative soils.

(2) Soil acidity determinations, made in connection with the survey, revealed a deficiency in the lime content of practically every soil analysed. Consequently extensive experiments were carried out in several localities to ascertain and demonstrate the value of ground and burnt lime to ameliorate this condition. In carrying out this programme a portable lime crusher was operated for two years in certain outlying sections where farmers did not have access to ground limestone supplies. This paved the way for the subsequent operation by private parties of several portable limestone crushers.

(3) Numerous limestone deposits from many sections of the province were analysed.

(4) Marl deposits were located at several places, especially in the Island of Cape Breton, from which parties are now securing marl with a content of from 60 to 90 per cent of carbonate of lime, at a mere fraction of the cost of the machine-ground product.

(5) Experimental demonstration plots were established at several localities for the purpose of studying and demonstrating the fertilizer needs of soils.

(6) Since 1920, experiments have been made to determine the value of salt for soil improvement purposes, the source of supply being the Malagash salt mines, recently discovered and now being operated in Cumberland county.

(7) A division was established in 1912 to make farm surveys and to demonstrate the value and the most expeditious means of farm drainage. This branch of the service was quite extensively developed up to the end of 1914, when Mr. B. H. Landels, the Superintendent in charge, went overseas for military service and fell on Flanders fields. The cost of field tile advanced to such high figures that interest in this branch of work practically ceased. Since that time, a few surveys have been made annually by other members of the college staff, but activities have been very much

reduced in comparison with 1914 and immediately preceding years.

(8) Judges in connection with the various field crop competitions and demonstrations were supplied. These did a great deal to promote the improvement of such field crops as oats, wheat, potatoes, and to a lesser extent, clover.

Fruit Growing

In 1901, the Provincial Department of Agriculture inaugurated a system of so-called Model Orchards in counties lying outside of the recognized fruit belt. When the grant became available, this service was supplemented by instituting a number of demonstrations in the improvement of old and neglected orchards, and also by demonstrating the practicability of vegetable gardening in certain parts of the country where this branch of horticulture had hitherto been neglected.

Finally, to facilitate the publication and distribution of a complete report of the Nova Scotia Fruit Growers' Association, a grant of $300 was paid annually to that association, with the result that much greater publicity was given to its valuable deliberations.

Entomological Work

One of the first appointments made after the Agricultural Instruction funds became available was that of a Provincial Entomologist. Subsequently, several field assistants were appointed. Part of the expense of the service has been paid out of provincial funds, but the major part has been paid out of the grant. A brief résumé of the services rendered by this division is as follows:—

San Jose Scale.—Found very widespread in 1912, Annapolis and Cornwallis Valleys, 723 cases 1912; 57, 1913; 3, 1914, 6, 1915; none since. Much better nursery stock now being imported as a result of work. In 1914 about one half stock entering province was infested with scale; in 1921, none. Advantage was taken of inspection to make complete census of fruit industry with respect to acreage, treatment for pests, etc. Information filed, card catalogue system.

Brown-tail Moth.—1913-14, 24,156 nests taken; about 1,000 in 1921-22. Effort to keep moth in check until public are informed as to methods of control and until parasites are established; also to wipe out outbreaks on wild land.

Green Apple Bug.—Doing great damage though unrecognized in valley orchards, insect not even described or named at start of our investigations, Biology and control worked out. Coloured chart prepared and bulletin published.

Apple Maggot.—Complete census made and distribution of pest determined. First to demonstrate on large scale that insect could be controlled by poison sprays without use of sweetened baits. Extensive biological studies. Coloured chart and bulletin issued.

Spraying and Dusting.—Seven years of standard orchard experiments to secure data on which to base spraying and dusting schedules. Not yet published.

Apple Sucker.—Pest new to North America discovered. Complete monographic account nearing completion. Coloured chart and bulletin in course of preparation and further extensive practical work and demonstrations now under way.

Vegetable Insects.—Too much to report fully under this. Most notable success with cabbage maggot. Fully demonstrated efficacy of corrosive sublimate for early cabbage and cauliflower, confirming work at Ottawa and Guelph; also working out treatment for seedlings. Other satisfactory remedies secured, which it is hoped will have some application to pest control. Illustrated bulletin in course of preparation.

Hand Book of Nova Scotia Insects.—Notes, illustrations (several in colour)

in course of preparation. To be a standard work for rural teachers, farmers gardeners, fruit growers, etc. Over 700 photographic illustrations and many line and wash drawings prepared for above.

Lantern Slides, etc.—Many coloured slides made for farmers' meetings, short courses, etc. Many demonstration mounts for exhibitions and short courses prepared, illustrating all stages of common insects and giving directions for control.

Bee-Keeping. — Directed extension work in bee-keeping and the campaign against American foul brood. This disease was widespread in 1914; many cases treated. Only one case discovered in 1921.

Short Courses

Commencing in the year 1914, from three to six short courses of an average duration of three days each, have been annually conducted, and paid for out of the grant. To facilitate the holding of these courses, special grants have been paid to communities that agreed to contribute funds for the purpose of erecting new buildings or modifying old buildings to properly house the short course sessions. Such grants have to date been given in the following communities: Yarmouth, Bridgewater, Lawrencetown, Shubenacadie, Stewiacke, Musquodoboit, and Antigonish. The courses have been uniformly largely attended, commencing in 1914 with an average daily attendance of 125, and increasing in subsequent years to 200. This must be regarded as an unusually large response to efforts made to carry agricultural instruction ouside the college hall. Satisfactory buildings have been to a considerable measure responsible for this outstanding success, but it should be added that no pains have been spared to provide the best teachers available and to make the courses as profitable and popular as possible. This is a service we would like to extend, but as the majority of the teachers have been members of the Agricultural College staff, it has been found difficult to spare them for any greater length of time in any one year.

Women's Department

The Women's Division was organized in 1913, and all expenses have been paid out of the grant. A superintendent was appointed in 1913, and temporary assistants have been added from time to time since. Fourteen women's institutes were organized during the first year. This number has now been increased to 76 with a membership of over 2,500. The activities of these institutes have been devoted to many laudable objects, including, during the war, the popularizing of home canning and other methods of conserving food, the giving of substantial supplies and money, including a motor ambulance to the Red Cross. Since the close of the war, some of the outstanding lines of activity have centered around the building of community halls and other local improvements, the encouragement of school exhibitions, school libraries, improving the sanitary condition of schools, the facilitating of hot school lunches, etc. Practically every activity which may be undertaken by women who are interested in community improvement has been at least commenced and in many cases carried on to successful conclusion by the women's institutes of the province.

In addition to the foregoing two short courses in home economics and allied subjects have been annually conducted at the Agricultural College:—(1) A midwinter course for girls and women of all ages, and (2), a girls' course in the month of July. Several two-day short courses in home economics have been conducted at local centres, and numerous meetings have been held in every part of the province.

A summer Women's Institute convention has been held annually at the Agricultural College, attended by delegates from practically every institute in the Province. One delegate from each institute receives one-half of her

train fare and $2 per day towards living expenses. Each institute receives an annual grant of $5.

General

In addition to the foregoing branches of activity, financed by the grant, small appropriations have been annually set aside for certain miscellaneous purposes such as securing films for moving pictures, the holding of special meetings, and the paying of incidental office and other routine expenses. However, the foregoing constitute the major branches of activity. But one other branch of the service remains, and that a most important one, namely, the assistance given to school work in the province. Upon this matter the Director of Rural Science for Nova Scotia, Mr. L. A. DeWolfe, presents the report ensuing.

RURAL SCIENCE IN NOVA SCOTIA SCHOOLS

BY L. A. DeWOLFE, M. Sc., DIRECTOR

After nearly nine years of Rural Science in the schools of Nova Scotia, a brief survey of attempts and accomplishments is in order. Through the assistance of the Federal grant of 1913, we have been able to do much that could not otherwise have been attempted.

It must be noted that, in this province, the work has been administered by the Department of Education, though the funds were supplied through the Department of Agriculture. Such a system has both advantages and disadvantages. Agriculture is more popular than education, which gives that department a distinct advantage. On the other hand, many of the administrators of the Education Department, being conservative in their proclivities, do not heartily support innovations introduced from an outside source. Because of this attitude, progress is slower than it should be.

Pioneer Work

Throughout the past nine years our interests have necessarily several times changed ground. Among our earliest efforts, besides gardens and exhibitions, were the introduction into rural schools of practical health teaching, including the hot noon lunch. In a short time, however, the Women's Institutes came on the stage, and have largely relieved us of the hot lunch propaganda. In the same way, the newly organized Public Health Department has taken over our health teaching. Of course we still co-operate with these organizations wherever possible, and we introduce their work in regions they have not yet reached.

Exhibitions

School exhibitions and school clubs have been successful. In the former, the Women's Institutes are also becoming active; but not more than one-eighth of our annual fairs have yet come within their scope. No outside organization has yet touched school clubs, with the exception of poultry and live stock clubs. These have been managed directly by the Departments of Agriculture—poultry by the provincial department, and live stock by the federal department. Garden clubs, school improvement clubs, sewing clubs, and debating clubs exist in about 200 rural schools. Since 1913, school fairs have increased from four to two hundred. Where only six schools exhibited their produce in 1913, 450 schools exhibited in 1922.

Every county exhibition gives a prominent place to children's exhibits of farm produce. At Bridgewater,

Stewiacke, Shubenacadie, Yarmouth, and Antigonish, the school department is the biggest single feature of the annual county exhibition. Before 1913, "Children's Department" meant only writing and drawing. Now, vegetables, flowers, woodwork, cooking, canning, and sewing are common exhibits. Our efforts are now directed towards improving the educational standard of our exhibitions. This, we are glad to say, has already improved wonderfully.

Gardens

School garden work has also given gratifying results. Under the Macdonald Consolidated School Movement, school gardens were well established 15 or 20 years ago. Later, with changing teachers, the work deteriorated. Since 1913, however, it has been revived; though along new lines. We found that the home garden was much more easily handled than the garden on the school grounds. At present about 5,000 school children each year make home gardens under school direction. Our teachers, too, have learned to make these gardens the basis for many regular school lessons.

Teacher Training

Our greatest opportunity, however, lies with the teacher-training work in the Normal College at Truro. It is fortunate that the Director of Rural Science is also an instructor in the training school, where he comes in contact with the future teachers, can present his point of view, and knows in advance what to expect of each teacher. The Summer School, too, affords a similar advantage with a new group of teachers. The Summer School costs about $4,000 (one-third of our total allowance), but it is undoubtedly money well spent. In regular Normal College classes, every student does practical work in seed germination, seed testing, grafting, potting, shifting, soil physics, and chemistry, fertilizers, hot-beds and cold-frames, farm and garden botany, and practical garden work. Our large school garden is intensively worked, and all students have a share in the work. Two large greenhouses afford good laboratories during the winter months. Last year we gave away, through teachers, from our school garden, flower seeds which, if purchased, would have cost fully $200.

Travelling Teachers

For two years we carried on, in a small way, the most effective experiment of our whole experience. This was a system of travelling rural science teachers. We had observed that inexperienced teachers often failed to grasp the significance of our teaching, or were unable to introduce new sujects. Accordingly we appointed a half dozen capable teachers, each of whom travelled over a district of about twenty schools, returning to each school once in two or three weeks. For lack of funds we had to drop the work, but even yet we are frequently asked when such a system will be renewed. The state of New Jersey now uses the same system, but it applies it to regular school subjects; and it is pronounced "the finest educational effort in the United States." It is certainly greatly needed in Nova Scotia.

Under the leadership of the Travelling Teachers, garden clubs, exhibitions, school improvement clubs, canning clubs, milk-testing clubs, etc., received new impetus. At one district exhibition, the children displayed 700 jars of canned vegetables and fruit. This work was done under the travelling teacher's supervision during vacation and after school hours. Such work would have been practically impossible without a special teacher. The same teacher conducted a very enthusiastic sewing and wood-working club.

In another district, stock-judging and milk-testing took precedence over other activities. There a community

exhibition was organized where both children and grown-ups brought their produce. In a third instance, the school parade and school sports brought the whole community to the fair; and the travelling teacher took advantage of the opportunity to address the audience on the needs and aims of a modern school. Another efficient special teacher demonstrated the relating of all regular school subjects to home projects. This one demonstration was worth many times what it cost.

In the same way, others reached their goal through school health, hot-beds, etc. It is worthy of note that one community club organized three years ago is still in existence, and is hopefully awaiting the time when another travelling teacher will come to replace the one removed two years ago. Thus the influence of those good teachers remains, though they were in the field a comparatively short time.

May we further note with satisfaction the fact that these special teachers secured the active support of agricultural societies in their work.

Material Aids

Among material aids in our teaching, we are well supplied with up-to-date reference books. We also circulate among our best teachers, books and magazines on the short monthly circuit plan. This greatly assists those who cannot afford to buy books for themselves. At our Normal College, we also have a Pathescope moving picture machine, a lantern, and a good supply of microscopes. We occasionally borrow slides and films from the International Harvester Company by paying expressage, in addition to regular films from the Pathescope Company and from the Agricultural College. We also have published a four-page "Rural Science Bulletin" once a month since 1915.

Recreation

Realizing that the underlying cause of our young people leaving the farms was not so much the difficulty of *making a living* as it was the *monotony of living,* we very early introduced plays, games and community recreation through the teachers. School games calling for teamwork were stressed, and every Normal trained teacher left Truro with some sort of a vision of what her community duties were. She was trained not only in school games, but community entertainments. We have ample proof that such activities proved popular; and teachers assure us that, through play, they have been able to teach many useful lessons. Miss Dora M. Baker, Associate Director of Rural Science, has been wholly responsible for this phase of the work; and she has rendered efficient service. No department of our training school receives so many requests for help from former students as that presided over by her. She has taught our teachers the value of dramatization, as applied to school subjects and to rural life.

Drawbacks

No system has yet attained ideal conditions. In Nova Scotia, we meet certain difficulties that are common to all provinces. In addition we have the conservatism of the East, and well established tradition to fight against. The newer West has no tradition. There, a spirit of optimism prevails. Here, our educational system is wedded to tradition.

Our greatest drawback is the youth and inefficiency of our teachers. Coupled with that is a lack of interest in schools on the part of the public. While modern methods have been applied to every other phase of farm life, there is no serious demand for a modern school. This is because our teachers and other educationists have not educated the public to the meaning of "modern" in school affairs. The first step towards

remedying such a condition, is to require students to submit results of, and certified reports on, some project work in agriculture, instead of book examinations, as at present. We are directing our efforts towards this goal at present; but progress is slow.

Summary of Results

In spite of the foregoing drawbacks, we have no reason to be discouraged. To show in tabular form what we have accomplished along lines that lend themselves to statistics, I submit the following:—

Activity	No. of Schools, 1913	No. of Schools, 1921
Hot Noon Lunch	0	100
Applied Hygiene	20	300
Local School Fairs	4	200
Schools represented at Local Fairs	6	450
County Fairs carrying School Departments	0	8
School Clubs	0	260
Home-School Gardens	0	5,000

The annual allowance of $12,000 for Rural Science work is distributed in round numbers about as follows:

Teacher-Training, Summer School (Salaries, Bonus, Travelling)	$ 4,000
Teacher-Training, regular Normal Course (Salaries)	4,000
Travelling (Rural Science Director)	600
Office and garden maintenance	600
Books, Magazines and Equipment	800
Balance, as it accumulates, spent on Travelling Teachers	2,000
	$12,000

Our teachers have inherited a narrow interpretation of the school curriculum. To them, every subject is a book subject. Practical work has not been a part of their early professional training. For that reason, I believe it is most desirable that we employ an efficient body of specially trained travelling rural science teachers to supplement the work of the regular teacher. Our experience has proved the soundness of this policy. A general grant for such a purpose would, I am sure, bring more tangible results than any other agency we have yet tried.

THE AGRICULTURAL INSTRUCTION ACT IN MANITOBA

BY JAS. H. EVANS, DEPUTY MINISTER OF AGRICULTURE

IN carrying on extension work in Manitoba the principle adopted at the beginning was that practically all of the funds provided under the Agricultural Instruction Act should be expended in the rural districts. To that end a general programme was mapped out under the following divisions:—

Home Economic Extension;
Agricultural Representatives;
Boys' and Girls' Clubs;
Extension Schools;
Community Meetings.

Under Home Economics was included demonstrations in cookery, canning and home nursing, and dressmaking and millinery short courses. Commencing with a staff of one in 1914, the work gradually increased until at the present time seven specialists are employed as follows: four dressmaking, two millinery, one cookery and one in charge of this branch of the work.

During the past year, 144 dressmaking courses were held with a total enrolment of 2,186, and 79 millinery courses with an enrolment of 1,825.

The following figures taken from the 1921 annual report will give some idea of the advantage of this kind of extension work from an economic standpoint. "The total cost of the short courses was, salaries $7,900, railway and hotel expenses, $5,366, or a total of $13,166. Value of completed garments, etc., less cost of materials, $27,565; total gain $14,391."

In 1917 when a Public Health Branch was established, home nursing was discontinued by the Extension Service.

Agricultural Representatives

In 1915, six Agricultural Representatives were appointed, but by the end of 1916 all of them had either enlisted or had returned to the home farm to take the place of some other member of the family who had gone overseas. No effort was made until the close of the war to further develop this branch. At present there are six agricultural representatives with a Director in charge, and additions will be made as rapidly as men can be secured who have the required training and the correct view point for this kind of work.

The aim at present is to limit the territory in which a representative operates to from ten to fifteen townships—a township being six miles square. This enables him to take care of all phases of agriculture within this area, such as live stock improvement, boys' and girls' clubs, weed control, and occasionally to act as secretary of the Agricultural Society and other organizations of an agricultural nature.

Home Demonstration Agents

The first permanent Home Demonstration Agent has just been appointed. She will have her headquarters at Roland and will be assisted in developing her work by a Home Bureau which will have in its membership representatives from the Trustees Association, Teachers' Association, Women's Institutes, United Farm Women, Municipal Councils, and other recognized organizations working for community improvement.

Miss Thordarson, the young woman appointed to this office, is a graduate of the Manitoba Agricultural College, having taken the whole five-year course. Miss Thordarson before entering the college was a member of the Extension staff in the capacity of instructor in dressmaking, and during the summers while attending the college she continued to do this work. She will thus be able to effectively handle all the short course work in her territory as well as assisting in Boys' and Girls' club work, produce marketing, teaching home economics to classes in the consolidated schools, and demonstration team work in the rural schools.

Boys' and Girls' Clubs

The first clubs were organized in the spring of 1914 when five clubs were established. There has been a steady development right up to the present. There are now 225 central clubs with approximately 1,600 branches and over 30,000 members. The figures for the past year are as follows: Membership 35,285; 215 club fairs were held at which there were 30,237 exhibitors: attendance, 36,053 adults and 42,877 children, with a total of 130,196 entries, made up as follows: pigs 1,302, calves 1,167, sheep 392, colts 397, dairy 2,497, poultry 5,375, grain 1,443, garden 22,355, cooking 14,784, sewing 13,801, canning 6,123, weeds 2,225, mechanics 2,285, insects 165, specials 1,871, school 54,014.

Possibly the greatest advance was made four years ago when the first demonstration teams were organized. Last year over 1,000 girls took part in this kind of work, and 102 of the girls who made the best showing were given a free trip to Winnipeg, where they competed for Provincial honours. Already (Feb. 15) 1,500 are enrolled in demonstration teams and the following subjects are being studied: Canning, dyeing, laundry, millinery, quick breads, bread, flour, potatoes, milk testing, tex-

tiles, flavouring extracts, beverages, upholstering, eggs, milk, home cleansers, labour savers, table setting, balanced meals, patterns, oils, shoes, flax, rye, oats, corn, macaroni, food chopper, hot lunches, and home decoration.

One hundred and fifty girls will come to Winnipeg next September, and in addition, the State of Iowa is sending its champion sewing team, Minnesota its champion bread baking team, and North Dakota its champion canning team; and it is expected that Manitoba's champion textile team will demonstrate at the Minnesota State Fair.

One hundred and six of the champion live stock boys were also given a trip to Winnipeg, and next September 150 will take the trip.

The success of club work is due to the close co-operation between the Departments of Education and Agriculture and the Agricultural College. The Boys' and Girls' club method of teaching agriculture has been adopted by the Department of Education as the most feasible plan; and from ten to twelve lectures on the conduct of club work are given by members of the extension staff to each class of teachers at the Normal School. The inspectoral division has been taken as the unit for organization purposes, and the inspector is the club leader for his division.

School and club work is shown at every fair. The inspector judges the school work or arranges for some one else to do so. Judges for the agricultural and home economics work are provided by the extension service, a great deal of this being done by members of the Agricultural College staff. As it is necessary to depend on volunteer local leadership, the Department of Agriculture provides a grant of 50 per cent of the money paid out in cash prizes but not more than 15 per cent of the grant is available for school work. These grants are paid out of Provincial funds.

Extension Schools for Men

Extension schools, or short courses, have been carried on regularly for eight years during the winter months. These courses extend over a period of from one to two weeks. Gas engine schools have been extremely popular, 108 courses having been held with an aggregate enrolment of over 5,000.

Agricultural courses have been held each year. During the war the attendance was limited owing to the majority of the boys being with the colours. These courses are usually of from ten days to two weeks duration, and two or three instructors have been provided for each.

During the summer holidays a large number of ten day short courses in woodworking were held for the older boys and girls and proved very successful.

Community Meetings

Community institute meetings have always been an effective phase of extension work. Although these meetings were held in every hamlet in the Province, a special effort was made to reach the people living in the newer districts. Lecturers have at times been back from 40 to 45 miles from the railroad. During the past year 380 of these meetings were held with a total attendance of 35,801, and 580 addresses were delivered.

The motion picture has been a very effective part of this work. The Department of Agriculture now owns 14 Victor cinema machines and over 250 films, 25 of which were made in the Province under the direction of the Agricultural College and the extension service. These also were paid for out of Provincial funds.

PROFIT COMPETITIONS CONDUCTED BY JUNIOR ONTARIO FARMERS, 1921

BY W. D. JACKSON, B.S.A., ASSISTANT DIRECTOR OF AGRICULTURAL REPRESENTATIVES

THE value of the various crop and live stock competitions conducted by the Junior Farmers under the supervision of the Agricultural Representatives, is indicated by the increasing number of contestants from year to year and the interest shown by them in the keeping of detailed records. Two hundred and eighty-four young men entered the various competitions last year and the majority of them did very creditable work. Owing to the very unfavourable season, together with the slump in prices, all contestants were not able to show a profit. Competitors who completed the competitions in all details received a valuable training in better farm methods and production costs, although they may not have won a prize or shown a profit on the undertaking.

All competitions were open to young men under 30 years of age who had not won a prize in a competition in previous years. The prize in each competition consisted of railway transportation, board and lodging while attending one of the short courses at the Ontario Agricultural College, Guelph, or the special short course in general agriculture at the Kemptville Agricultural School, Kemptville. Winners in the competitions in Western and Northern Ontario attended the short courses at the Ontario Agricultural College and the Eastern Ontario winners attended the short course at the Kemptville Agricultural School. In all thirty-seven competition winners were provided with transportation to Guelph and Kemptville.

During 1921 competitions were conducted as follows:—

Acre Profit Competitions with Oats 8, Potatoes 7, Corn 1, Turnips 1;

Dairy Profit Competitions 3;

Baby Beef Competitions 4;

Feeding Hogs for Profit Competitions 13;

Total, 37 competitions.

Acre Profit Competitions

Prizes in these competitions were awarded for the largest net profit per acre. Unless six entered and four completed the contest, no prize was awarded. In cases where twelve entered and eight completed the work, two prizes were awarded. The contestants themselves decided on the crop for their competition. In the case of the competitions with oats and barley, each contestant was required to have at least 5 acres of the crop; this enabled him to also enter in the standing field crop competition. For all other crops the area was one acre. Each contestant was required to keep, on forms supplied, an accurate record of all labour, cost of seed, fertilizer and other expenses in connection with producing the crop.

In calculating the cost of production in the various competitions, the following values were used:—

Man labour to be reckoned at 30c. per hour;

Horse labour to be reckoned at 15c. per hour;

Barnyard manure applied to this crop at $1 per ton or two-horse load;

Barnyard manure applied to previous crop at 50c. per ton or two-horse load;

Commercial fertilizer applied to this crop at one-half of cost price;

Rent of land eight per cent of the selling value of the land, this to be figured by the Representative and the Junior Farmers' Improvement Association;

Plowing, $4 per acre. This is figured on the basis of hiring a man and a team at the rate of $6 per ten-hour day.

	Value Seed Used in Planting	*Value Product Harvested*
Turnips	$0 65 per lb.	$0 12½ per bushel
Mangels	0 50 "	0 12½ "
Potatoes	1 00 per bushel	1 00 "
Spring wheat	2 00 "	1 20 "
Oats	1 00 "	0 45 "
Barley	2 00 "	0 65 "
Field beans	3 00 "	2 75 "
Field peas	3 00 "	1 50 "
Corn for seed	2 25 "	0 63 "
Corn for silage	2 00 "	5 00 per ton

ACRE PROFIT COMPETITIONS, 1921

OATS—45c. PER BUSHEL

County and Winner	Yield	Value	Cost of Production	Profit or Loss
	bush.	$	$ cts.	$ cts.
Lennox and Addington— Cecil Luther, Napanee	61	27 45	26 02	1 43
Prescott and Russell— Henri Dupont, Curran	40	18 00	19 05	1 05 Loss
Bruce— Lloyd Hopper, Paisley	34⅔	15 57	16 73	1 16 Loss
Ontario— Harold E. King, Cannington	43·5	19 57	21 58	2 01 Loss
Middlesex— L. A. Baker, Lambeth	45·15	30·32	24·08	3 76 Loss
Kenora— Melville R. Fisher, Dryden	20	9 00	13 19	4 19 Loss
Lincoln— J. C. Thomspon, Beamsville	32	14 40	19 69	5 29 Loss
Lambton— H. C. Nesbitt, Mooretown	28·5	12 85	18 30	5 45 Loss

POTATOES—$1 PER BUSHEL

Timiskaming— Chas. H. Thomas, New Liskeard, R.R. No. 1	617	617 00	80 20	536 80
Thunder Bay-Port Arthur— Conwell Pifer, Kakabeka Falls	528	528 00	50 35	477 65
Timiskaming— Bruce Irvine, Hanbury	506⅔	506 66	83 37	423 29
Manitoulin— Llewellyn Honess, Poplar	258	258 00	79 96	178 04
Simcoe— Ernest Switzer, New Lovell	219	219 00	50 80	168 20
Bruce— W. A. Leeder, Port Elgin	170	170 00	46 80	123 20
Norfolk— Aubrey Adams, Wilsonville	131	131 00	73 60	57 40

CORN—63c. PER BUSHEL

Essex— R. M. Elliott, Comber	53	33 39	29 05	4 34

TURNIPS—12½c. PER BUSHEL

Algoma— Chester E. Farmer, Sault Ste. Marie, R.R. No. 2	1,230	153 75	79 43	74 32

In computing profit, no allowance was made for overhead expenses, such as interest on investment, charge for machinery, nor for depreciation of any kind.

Dairy Profit Competitions

The Dairy Profit competition extended over a period of seven months. Contestants were required to weigh each milking and to take a two-ounce sample three times a month. These samples were tested and the amount of butter fat determined each month by the Agricultural Representative. Accurate records were also required as in the case of the other competitions and the profit was determined by deducting the cost of feed from the value of the butter fat and skim milk. Prizes were awarded for the largest net profit for a cow or heifer which had not been previously entered in a Record of Performance or other similar yearly test.

In compiling results, butter fat was valued at 62¾c. per pound for March, 58¾c. for April, 28½c. for May, 27½c. for June, 35c. for July, 40c. for August, 39c. for September, 40c. for October, and 43c. for November. Skim milk 30c. per cwt.

Pasture and feed values were as follows:—

For Feeding Hogs, Baby Beef and Dairy Profit

Pasture	$ 1	per month
Ground Oats	35 00	per ton
" Barley	45 00	"
" Peas	55 00	"
" Rye		
" Wheat	61 50	"
" Corn	40 00	"
Corn on Cob	34 00	"
Bran	30 00	"
Shorts or Middlings	32 00	"
Oil Cake	54.00	"
Cotton Seed Meal	56 00	"
Gluten Feed	50 00	"
Low grade flour or red dog	53 50	"
Tankage	62 50	"
Hay	20 00	"
Alfalfa	23.00	"
Straw	10 00	"
Silage	5 00	"
Roots	5 00	"
New Milk	35 00	"
Skim Milk	6 00	"
Buttermilk	4 75	"
Whey	3 00	"
Green Feed	2 00	"

DAIRY PROFIT COMPETITION, 1921

County and Winner	Value of of Feed	Milk Lbs.	% Fat	Lbs. Fat	Value	Lbs. Skim Milk	Value of Skim Milk	Net Profit
	$ cts.				$ cts.		$ cts.	$ cts.
Prescott and Russell—								
Hector Carron, Curran	13 76	6,594	4·12	263.55	93 12	6,330.45	19 00	98 36
Grenville—								
C. Floyd Barber, Merrickville	27 07	6,908	3·3	228·6	87 46	6,679·4	20 03	80 42
Dundas (W. Stormont)—								
Geo. B. Baker, Newington	49 21	5,439	4·26	221.95	86 87	5,217	15 63½	53 29½

In this competition no charge is made for labour, interest on investment or other overhead expenses. The profit shown in the value of the butter fat and skim milk above the cost of feed and pasture.

Baby Beef Competition

Prizes in the Baby Beef competition were awarded on the basis of 75 points for quality and finish and 25 points for net profit. Contestants were permitted to enter either pure bred or grade heifers or steers, to start with several calves and discard the less promising ones as they developed. Calves entered were born after September, 1920, and the competition concluded in November, 1921.

Special prizes are offered at the Ontario Provincial Winter Fair, Guelph, for animals entered in this competition. This feature created considerable interest, and some very excellent animals have been shown in this class at the Winter Fair.

In calculating the net profit, the animals were valued at 9c. per pound, the average price during the marketing season. Feed was valued as follows:

Pasture, 75c. per month; nurse cow, $6 per month; grain, hay, etc., as for Dairy Profit competition. The cost of production included only the cost of feed, pasture, nurse cow, and the initial cost of the calf at $5. These points should be taken into consideration when making use of these results.

BABY BEEF COMPETITION, 1921

County Winner and Breed	Date of Birth	Cost of Feed Consumed plus Initial Value of Steer	Weight of Steer	Value	Net Profit	Score
		$ cts.		$ cts.	$ cts.	
Bruce— Harold Cormack, Paisley, Shorthorn Grade	Dec. 15, 1920	72 99	1,020	96 90	23 91	93¼
Bruce— J. Fraser Scott, Pt. Elgin, Shorthorn Grade	Oct. 20, 1920	61 74	750	71 25	9 51	81·3
Wellington— John H. Saunders, Arthur	Sept. 8, 1920	60 97	857	81 40	20 44	75½
Huron— Harold Hunter, Exeter, Aberdeen Angus Grade	Jan. 6, 1921	114 31	810	76 95	Loss 37 36	64·9

Feeding Hogs for Profit Competition

Each contestant was required to feed a pen of not less than four bacon hogs and to keep accurate records of the feeds consumed from which the net profit per cwt. of gain was computed. The awards were made on the basis of 60 points for highest net profit per cwt. of gain, 20 points best kept records, and 20 points for highest gain in weight except that for light and heavy hogs. Two points were deducted for every 5 pounds over 230 pounds or under 180 pounds. The feeding period commenced when hogs were 6 weeks of age and continued until they were finished for market and not more than 28 weeks of age. A certificate was required of the weight of the hogs at time of marketing. In arriving at the net profit per cwt. of gain from 6 weeks of age, live hogs were valued at 11c. per pound, the average top market price for six weeks beginning September 1.

Feeds were valued as follows: Pasture, $1 per hog; other feeds as for Dairy Profit competition.

FEEDING HOGS FOR PROFIT COMPETITION

County and Winner	Length of Feeding Period	Average Cost of Feed per Hog	Average Weight Alive When Marketed	Average Gain in Weight From 6 Weeks of Age	Value per Hog of Grain in Weight	Average Net Profit per Hog	Average Net Profit per Cwt. Gain
		$ cts.	Lb.	Lb.	$ cts.	$ cts.	$ cts.
Manitoulin— Willie Tustian, Kagawong	June 8-Oct. 26 140 days	6 76	196	169¼	18 61¾	11 85	7 00
Bruce— C. Wilfred Grant, Paisley	June 16-Oct. 17 124 days	7 89¾	220	193¾	21 09	13 19½	6 88
Dundas— Mortimer Eastman, Lunenburg	March 30-August 15—138 days	7 06¼	195	171	18 81	11 75	6 87
Durham— John S. Cryderman, Bowmanville	February 21-July 27—156 days	7 19	221·5	171·5	18 89	11 70	6 81
Lambton— Chas. L. Hinks, Mooretown	June 15-Sept. 20 97 days	8 08	192·5	163	17 88	9 80	6 03
Ontario— Walter Kirk, Brooklin	April 23-Nov. 5 196 days	10 33	212½	187½	20 62	10 29	5 49
Huron— C. A. Corbett, Fordwich	April 29-October 3—157 days	9 16	200	165	18 15	8 99	5 42
Lennox and Addington— Karl S. Denyes, Odessa	April 6-Sept. 10 157 days	10 53¼	206¼	186¼	20 48¾	9 95	5 34
Simcoe South— Cecil A. Newton, Egbert	June 5-Nov. 2— 150 days	11 27	213⅓	191⅓	21 05	9 77	5 11
Sudbury— Isaac Muncaster, Walford	May 11-Oct. 15 157 days	10 88	212½	183¼	20 15	9 27	5 06
Rainy River— Wesley Harron, Emo	May 14-Nov. 12—182 days	12 53	232¼	214¾	23 62	11 09	5 00
Grenville— John H. Hulton, Merrickville	May 20-Oct. 20 153 days	13.82¾	225	202½	22 27½	8 45	4 17
Waterloo— Lorne Roth, New Hamburg	July 6-Nov. 18 135 days	13 02½	178⅓	152⅝	16 78½	3 75	2 46

It should be noted that the cost of production in connection with the feeding hogs for profit competitions does not include labour or other overhead expenses and this should be given due consideration when using these results.

The average cost of feed per hog was $9.89 for the 52 hogs fed by the winners, the average net profit per hog $9.98, the average net profit per cwt. of gain from 6 weeks of age $5.51; the average number of days in feeding period 149, and the average gain in weight from 6 weeks of age 181 pounds, or an average gain of 1⅛ pounds per day throughout the feeding period.

QUEBEC LEGISLATION, 1922

THE agricultural legislation passed at the recent session of the Legislature of the province of Quebec is summarized as follows:—

An Act to amend the Act concerning Farmers' Clubs.—The purpose of this Act is (1) To allow the clubs to pay their secretary a salary amounting to 10 per cent of the gross receipts, instead of 7 per cent as heretofore; (2) To provide for a change in the system of distribution of grants paid to clubs keeping breeding animals, and to change the amount of these grants under the regulations of the Council of Agriculture.

An Act to amend the Act concerning Agricultural Associations.—The purpose of the Act is to enable the associations to pay their secretary a salary amounting to 10 per cent of the gross receipts, instead of 7 per cent as heretofore.

An Act to amend the Act concerning the Improvement of Horses.—This Act provides for a few slight amendments to the general Act.

An Act concerning Loans made by the Quebec Seed Growers' Agricultural Co-operative Association.—This Act authorizes the Lieutenant-Governor in Council to guarantee certain loans up to the amount of $70,000 to the said association for the purchase of seed grain for farmers.

An Act to assist certain Municipalities in the purchase of Seeds or Seed Grain.—Under this Act, the council of any rural municipality, or a county council in districts that are not constituted as local municipalities, may borrow money, by note or otherwise, by resolution to this effect, for the purchase of seed grain to sell to farmers, or to lend to farmers to enable them to purchase direct. The amount owed to the municipality by the taxpayers is to be collected at the same time as the municipal taxes and constitutes a first mortgage on the possessions of the taxpayer up to the amount of $100.

AGRICULTURAL APPROPRIATIONS

	1922-1923	1921-1922
Agricultural Societies	$ 100,000 00	$100,000 00
Farmers' Clubs	65,000 00	100,000 00
Encouragement of agriculture in general including Demonstration Farms	450,000 00	350,000 00
The Agricultural and Horticultural Society of Montreal	.....	500 00
Pomological and Fruit Growing Society	500 00	500 00
Council of Agriculture	3,000 00	3,000 00
Agricultural Schools	90,000 00	40,000 00
Establishment and maintenance of a dairy school and intermediate agricultural schools	.....	50,000 00
Veterinary Instruction	6,000 00	6,000 00
House-keeping Schools (Ecoles ménagères)	30,000 00	25,000 00
Dairy Association of the Province of Quebec	2,000 00	2,000 00
Dairy School of the Province of Quebec, St. Hyacinthe, and official Laboratory	25,000 00	25,000 00
Dairy Industry and inspection of factories for the manufacture of dairy products	140,000 00	130,000 00
Horticulture	30,000 00	20,000 00
Journal of Agriculture	27,000 00	27,000 00
Aviculture	15,000 00	15,000 00
Apiculture	20,000 00	6,000 00
Exhibitions	32,000 00	32,000 00
Civil Government—Salaries	55,533 00	52,166 00
Total	$1,091,033 00	$984,166 00

FIELD CROP COMPETITIONS, 1921

ONTARIO

OVER two hundred Agricultural Societies entered the Field Crop Competitions during 1921, but, owing to the abnormal season, the competitors in many of them had to cancel their entries and the actual number of Societies to which judges were sent was one hundred and seventy-three.

During 1921 there was inaugurated, in conjunction with the Dominion Seed Branch, a Combined Standing Field Crop and Threshed Grain Competition, with a view to increasing the supply of pure seed grain in the Province which would be available for registration.

The returns of all the societies that entered the Combined Standing Field Crop and Threshed Grain Competitions are not yet complete, as the analysis of the samples of some of the grain in the bins has not been finished, but it is satisfactory to know that in spite of unpropitious weather last season which prevented the heads of grain filling out as usual, there will, nevertheless be several thousand bushels of good seed grain available for sowing in 1922.

Thirty-one societies entered the Combined Competition in oats, one in spring wheat, two in corn and three in potatoes, which is quite satisfactory for the first year. The Federal Minister of Agriculture has approved of the continuation of this Combined Competition in 1922, and if the season is a normal one, as more societies have signified their intention of entering, there will be sufficient pedigreed seed grain and certified potatoes to meet the requirements of this Province to a large extent.

Upwards of 1,000 farmers made a creditable showing in this co-operative work and stimulated the co-operative idea. A number of the societies have gone further and undertaken the establishment of seed-producing centres which was one of the objects aimed at.

The regular Standing Field Crop Competitions are being continued this year and judging from the entries already received more farmers will enter than ever before.

SASKATCHEWAN

Very exceptional interest was displayed in 1921 in Saskatchewan in field crop competitions. This was probably due partly to the fact that there was promise early in the year of particularly good crops, and partly to the new regulation requiring that a field crop competition be held before a seed fair grant could be earned. Following are some details concerning the competitions held:—

Competition	No. Societies Holding Same	Total No. of Competitors
Fields Wheat	31	397
Fields Oats	27	168
Fields Barley	10	31
Fields Flax	3	15
Fields Rye	5	18
Fields Potatoes	9	60
Combined Seed Crop and Cleaned Seed Competition (all wheat)	4	55
Forage Crop	14	47

As an indication of the quality of the fields entered, it is interesting to note that 123 out of a total of 452 wheat fields entered (including the combined competition) received a field score of 90 or over. Special mention might be made of the wheat competition held by the Carleton District Agricultural Society in which 19 out of 32 fields received scores of 90 or over; of the competition at Richard with 10 out of 15; and at Prince Albert with 10 out of 11 scoring 90 points or over.

The forage crop competition is one recently added to our list which is supported by a provincial grant equal to 50 per cent of prizes paid to a maximum of $75. The need for more knowledge regarding forage crops has become clearly apparent during recent years, and this competition was particularly

designed to encourage self-help among the farmers in meeting this need.

As will be noted, four societies, namely, Wawota, Prince Albert, Indian Head, and Strasbourg took up the new Combined Seed Crop and Cleaned Seed Competition in 1921, enrolling 14, 11, 14 and 16 competitors respectively. Only the first two carried the competition to completion. The other two competitions were cancelled owing to adverse harvest conditions. The grain was scored in the field by members of the field staff of the Provincial Field Crops Branch acting for the Extension department and the bin scoring was carried out under the direction of J. E. Blakeman, Western Representative of the Dominion Seed Branch.

The Provincial Committee, which determines what seed shall be used for these competitions, met on March 18, 1922, and decided that for this year only registered seed shall be used. This will probably result in fewer competitions being held than was anticipated, but it will mean that, where such competitions are held, there will be made available a large supply of reliable seed.

The only stipulation regarding seed used by competitors in 1921 was as follows: "The seed used by competitors should be registered or of such excellent quality in respect to freedom from weed seeds and trueness to type that in the opinion of the judge, when examining the field, it is good enough for competition."

ALBERTA

The standing Field Crop competitions and the Good Farms competitions in Alberta for 1921 did not bring out as many competitors as in former years. On account of climatic conditions there were poor crops in some sections of the province where field competitions, under normal conditions, are usually keen. Two competitions were held, one at Sedgewick and one at Lacombe, and were very satisfactory, both to the Agricultural Societies conducting the competitions, and to the Department of Agriculture.

The Sedgewick competition showed 24 fields of wheat, and 10 fields of oats entered for the Field Crops, and ten farms entered for the Good Farms. The quality of most of the fields entered was very good, the highest score being 95 out of a possible 100. A number of others scored over 90, and all were over 80. The winning score in the Good Farms competition was 87.

The Lacombe competition had 14 fields of wheat, 16 fields of oats, and 11 fields of barley entered, and the winning scores were equally as good as those in the Sedgewick competition.

THE GIRLS' INSTITUTES OF ONTARIO

BY EMILY J. GUEST, M.A., TORONTO

THE Junior Women's, or as they are popularly known, the Girls' Institutes, continue to be one of the interesting features of the Ontario institute organization.

Where their numbers are small, the girls usually carry on as an integral part of the Women's Branch Institute, receiving special consideration when the programme is being planned and carried out. As a rule also, one girl is elected to the Branch board of directors to represent the junior members and bring forward their views and desires. Sometimes also they form a girls' circle within the branch, having their own chairman who is a member of the executive, and making themselves responsible for all of some meetings or some of each. These methods remain popular

in many places where much driving is done as mother and daughter can thus come together to the meetings. Also the life and brightness brought into the meetings by the girls is greatly appreciated by the women.

Where there are a considerable number of girls brought together by such interests as one of the short courses, they frequently decide to organize a junior institute, still co-operating closely with the women's institute, if there is one, but planning and carrying on their own work and meetings and receiving similar help and recognition from the department in the way of grants, literature, and extension lectures. In their own programmes, besides the regular study of better and more scientific home-making—for as the majority of the girls are looking forward to having a home of their own, one of the primary aims of the club is to prepare them better to fulfill this mission—community matters, schools, hospitals, libraries, and recreation are given attention.

For the hospitals the branch undertakes plain sewing of such a kind that the younger girls can share in it. In some cases at least one complete infants' layette, cradle included, is made during the year.

The junior institutes are showing, too, an active friendly interest in the schools, visiting them and the teacher, giving prizes at the school fairs, encouraging the literary societies, and doing what they can generally to aid in getting better, cleaner and more attractive schools and grounds.

Besides an active sympathy with the improvement of the local libraries, the juniors avail themselves of the travelling girls' libraries sent out on loan by the Library Branch, Department of Education. The books are selected to meet the needs especially of girls and can be had for a period of six months in the institute by the branch paying one-way express charges. The travelling library is returned and, if desired, replaced by a fresh one.

Play has, of course, its legitimate place. Co-operation with the seniors has resulted in the provision for tennis, basket or volley ball, and other wholesome recreations in connection in some cases with the community hall grounds. At the indoor gatherings, essays, debates, one minute speeches, story telling, discussions, spelling and geography matches, music, contests, and folk games are features.

The branches plan their meetings—usually two hours in duration—to suit their own tastes and needs. The first hour is given to serious work—papers, debates, discussions, handicraft, domestic science, or the study of Shakespeare or some other author, and the second to recreation—chorus singing, instrumental music, physical culture, folk games, table games, and charades or tableaux in some branches.

Others devote an entire meeting to each of the following subjects in rotation:—

(1) Horticulture, Agriculture, and out-of-door matters;

(2) Literary and education topics;

(3) Practical and ideal home-making;

(4) Social.

It is expected that all social gatherings of junior institutes be properly chaperoned and close at a reasonably early hour.

Short courses by departmental demonstrators and lecturers remain popular. These are often carried on at the same time as the junior farmers' courses in agriculture, the two organizations uniting for a weekly literary afternoon and concluding with a joint banquet at which there are toasts, music, recitations, and speeches by prominent people.

One county followed up such a course in domestic science by selecting a team of four, a captain and three others, from each junior branch in the county, to put on a canning contest at the fall fair. The prizes were trips to institute conventions in one or other of Ontario's

leading cities, or canning outfits for the home. One such short course, recently closed, lasted for a month and brought together over two hundred and fifty young people from the countryside, being a veritable little travelling college, in a small centre remote from the large cities.

Some features of interest from the girls' programmes are:

Education: Studies in parliamentary law and procedure; How we are governed; Laws of health and beauty; English and Canadian literature; Public speaking.

Home Craft: Planning, remodelling, and furnishing a house; Understanding and caring for the human body; Good form in home and in public.

Income Earning Pointers for girls on the farm, in the home, in the community.

Healthful Recreation, out of doors; indoors.

Junior women's institutes may avail themselves of departmental assistance through the various short courses in domestic science, sewing, millinery, first aid and home nursing, and house decoration; also of help from individual lecturers on special topics in connection with the Institutes Branch of the Department of Agriculture; the travelling libraries, extension lectures, and assistance in the preparation of papers through the Packet Loan Library of the Ontario Agricultural College at Guelph.

PART III

Agricultural Education and Related Activities

SCHOOL FAIRS AND HOME GARDEN CONTESTS — ONTARIO — 1922

BY R. S. DUNCAN, B.S.A., DIRECTOR, AGRICULTURAL REPRESENTATIVE BRANCH

SCHOOL FAIRS have had a wonderful development in Ontario during the past few years. Their popularity does not seem to be waning in the least and it is a particularly encouraging sign to see the deep interest that is developing from year to year amongst the local people.

The growth of the movement can best be gleaned from the following figures given in approximately seven-year periods:—

	1909	1915	1921
Number of School Fairs held	1	234	449
Number of schools included	3	2,291	3,847
Number of children taking part	58	48,386	95,307
Number of home plots	58	51,243	114,216
Number of entries made at the fairs	174	116,236	193,545
Number of children attending fairs	80	72,860	154,831
Number of adults attending fairs	170	84,406	188,728
Total attendance at fairs	250	157,266	343,259

This is truly a phenomenal growth, and it is the desire of the department to extend from time to time this form of education to all the rural schools in the province in order that all school children may enjoy its benefits.

During the past season, the Ontario Department of Agriculture, through the Agricultural Representatives, distributed to the boys and girls enrolled in the School Fair movement the following quantities of seeds and eggs:—

Potatoes	1,039 bags
Oats, barley and wheat	252 bushels
Peas and corn (sweet and field)	24,100 packages
Beets, carrots, onions and parsnips	42,000 "
Mangels and turnips	12,800 "
Asters, phlox, sweet peas and cosmos	30,750 "
Eggs, bred-to-lay Barred Plymouth Rock	10,852

Each School Fair is carried on by a board of directors composed of representatives from the school, the Agricultural Representative acting as manager. In most cases the Representative is assisted by a local committee representing the teachers, trustees and parents, and where we have an active committee all pulling together, there is no weak link in the chain.

One of the greatest handicaps to better work is the annual change of teachers, but this is gradually being overcome because many teachers have had more or less experience with school fairs even before they graduate from the Normal schools.

It is very gratifying to report that the quality of the exhibits is improving from year to year. The pupils are gradually learning that it does not pay to bring anything but "good stuff" to the fair. The judges are requested to point out by comparison the difference between the exhibits awarded first prize and those awarded second, third, fourth, fifth and sixth prizes. Besides giving reasons for their placings, the judges try to point out to the exhibitors and others the desirable type, what constitutes quality in the various classes called for on the prize list, and to offer hints or

suggestions as to the preparation of exhibits. To my mind this is one of the greatest educational features of the school fair.

District championship School Fairs were held during the past season in the following counties: Frontenac, Halton, Norfolk, Oxford, Welland, and Wentworth, and Rainy River and Manitoulin districts. The first, second and third-prize exhibits from the various school fairs in the county or district were eligible for competition, the agricultural society supplying practically all the prize money.

Championship fairs are feasible only where it is possible to conduct the school fairs sufficiently early in the season to allow prize exhibits to compete at the place where the championship fair is held and where transportation facilities are sufficient. Boys and girls take a great pride in winning a championship ribbon, and the quality of the exhibits is reflected in the local school fair. The championship goal seems to be an added stimulus. The exhibits staged at these championship fairs were not only a credit to the pupils but also to the district from which they came. The pupils are "broadening out," and they are gaining a wonderful experience which will have its effect upon the larger fairs in the future.

During the past two or three years, there has been an agitation on the part of the officers of some agricultural societies to have the school fairs linked up with fairs held under society auspices. Those favouring the holding of joint fairs put forth the argument that there would be less duplication of work and effort and the combined fair would be more successful. This scheme has had a fair trial, and about the only thing to commend itself is the fact that the gate receipts are greatly increased. The greatest objection to holding joint fairs is the fact that in the great majority of cases there are too many counter-attractions and difficulty is found in carrying out the well-arranged programme for the entertainment and especially the education of the children. With this plan, the school fair would more or less lose its identity and defeat some of the objects for which it was originally formed, namely to give inspiration and create greater interest, broadly speaking, in agriculture.

The department feels that school fairs should be held separately and distinct from county or township fairs. In some communities, however, the local people feel that the two can be combined quite nicely, and in order to guard against the objections raised, the department insisted that where the fall fairs held under the auspices of the agricultural societies and the school fairs are conducted jointly the following conditions must be complied with:—

1. *Prize List.*—That the list of classes for the Rural School Fair, prepared by the Agricultural Representative and the Rural School Fair Association, be included in the regular prize list of the Agricultural Society.

That one copy of this prize list be distributed to each pupil or one copy to each family or household in the Rural School Fair Association.

That the prize list be issued not later than June 1. Where it is impossible to issue the regular Agricultural Society Prize List by this date the Society should issue a separate School Fair prize list for early distribution.

2. *Finances.*—That the Agricultural Society supply half the prize money, such sum not to exceed $75, for these classes and that the sum be paid in cash to the manager or secretary of the Rural School Fair Association prior to the fair.

3. *Accommodation.*—That the Agricultural Society supply suitable building or tent accommodation for displaying the pupils' exhibits, together with tables and poultry coops, and have same in readiness the day previous to the fair. Where this equipment is supplied by the Department of Agriculture, the Agri-

cultural Society must pay transportation and cartage charges, and furnish help to erect the tents.

That suitable field accommodation, properly enclosed, be definitely assigned to the Rural School Fair for the purpose of holding sports, parades, judging of live stock.

That a programme for the day be decided upon by Agricultural Society officials and Agricultural Representative to avoid clashing of events.

4. *Admission.*—That all the pupils and teachers in the schools taking part in the Rural School Fair be given free admission to the fair.

5. *Judges.*—That the Agricultural Society supply judges for exhibits such as poultry, live stock, vegetables, grains, etc., satisfactory to the Department.

6. *Protection.* (Constables).—That the Agricultural Society supply protection for Rural School Fair exhibits.

New Features

A successful school fair must have something new and worth while each year. The pupils demand change in order to keep up interest. Sports are merely an added attraction. Last year many Representatives conducted some competition that was entirely new to the children, such as judging competitions for teams of three boys in live stock, and for three girls in sewing or darning; individual competitions in naming weeds, apples, vegetables, and live stock, the latter from pictures; chicken plucking, boys' riding, girls' hitching and driving, public speaking and singing competitions and Strathcona Drill and school fair parade. Not all of these contests can be carried out at any one fair but a few new "stunts" each year add interest and keep up the enthusiasm of the children.

The Home Garden Contests

The Home Garden contest is primarily intended for the teen-age boys and girls on the farm. Sufficient seed is given each contestant to plant a plot 30 x 40 feet according to the accompanying plan. An optional plan is given to allow for horse cultivation; the vegetables being planted in 10 rows, 30 inches apart and 75 feet in length. The crops grown are as follows:—tomatoes, corn, cabbage, peas, beans, onions, radish, lettuce, parsnips, beets, carrots, swiss chard, cucumbers, squash, citron, and spinach. A special pamphlet, showing the crop arrangement, plan of garden, and giving cultural instructions is handed each contestant. Each contest comprises 25 gardens. During the past season the competitors paid the cost price of the seeds, namely 75 cents, and in all there were 75 Home Garden contests, including 1,875 pupils.

During the months of July and August, the Agricultural Representatives inspected the gardens and awarded prizes for the best gardens. In addition, special prizes were offered at the school fair and local fall fair for exhibits of vegetables from the home garden. Last year competitors were required to can products from their gardens and exhibit these at the fairs along with the fresh vegetables. This year it is planned to make canning optional.

The object of these Home Gardens is to interest boys and girls in better agriculture and encourage the use of more vegetables in the farm home. It is truly surprising what can be grown in a small garden, and after allowing the family free use of the vegetables grown many of the boys managed to dispose of the surplus products and made a little 'pin money.' They were thus able to thoroughly enjoy spending a little money earned by the exercise of their own skill. These early lessons in finance should stand them in good stead.

THE O.A.C. STUDENTS' CO-OPERATIVE ASSOCIATION

BY H. C. MASON, B.S.A.

THE first co-operative undertaking of the students of the Ontario Agricultural College was the establishment and publishing of the "O.A.C. Review," thirty years or more ago. The success of this oldest agricultural college magazine has been such that it has encouraged other developments in co-operation. Early in 1913 the Students' Co-operative Association was organized and a little later incorporated. The first year's business amounted to a few hundreds of dollars; last year's turnover totalled about $25,000, and it is still growing.

The association as at present constituted consists of three branches—the Supply Store, the Rink, and the Review. Each of these belongs to the student body and is managed by a committee of student-directors elected by the student body to that particular branch. Over all three is a central committee and a Managing Director, Mr. H. H. LeDrew. This organization gives scope to individual initiative in developing the various branches, and at the same time the central executive is there to co-ordinate the work of all three. If any one of the three branches fails to make a financial success for the year, it can be "carried" by one of the others.

The association is modelled upon the "Rochdale" pattern of co-operation. The distinctive features of this system are:—

1, Sales for cash only; 2, Sales for current retail prices to member and non-member alike; 3, The retention of part of the surplus or profit of the business for use in operation or expansion; 4, The distribution of the remainder of the surplus to members in proportion to their purchases, not to the amount of stock held. In the case of the Students' Association, the amount of "stock" held by each member is equal, and consists merely of the subscription price for the Review for the year and a season ticket for the rink. Proportional method of distribution of profits is one of the strong but little-understood points of the Rochdale system. In practice it works out thus:—Member A purchases $10 worth of goods through the Supply Store; Member B purchases $50 worth. A dividend of, say, five per cent is declared at the end of the year. Member A receives 5 per cent of the value of his purchases, 50 cents; Member B receives 5 per cent of the value of his purchases, $2.50. By this system the member whose business has been most valuable to the association receives the greatest return, which is undoubtedly as it should be.

The association has seen its dark days; the Rink twice collapsed under the heavy snow; real estate purchased for the erection of a large co-operative building has had to be carried all through the war period because of unsettled conditions; but the organization is still growing, and year by year is rendering more valuable service to the students of the O.A.C. and the agriculture of Canada as a whole. The O.A.C. Students' Supply Store now has a continent-wide reputation as clearing-house for agricultural text books. The outside "sales to non-members" last year reached $12,000. Within the past few months a motor truck has been added to the equipment, and the association truck now does all hauling of trunks, luggage, etc., for students as well as handling the ever-growing business of the association itself.

Not the least important work of the association is the education it affords in journalism, business management, and co-operation.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

"AVAILABILITY" IN PLANT FOODS

BY DR. A. McGILL, DOMINION ANALYST, DEPARTMENT OF HEALTH

MODERN facilities for the distribution of farm products together with the great increase of town dwellers that has occurred during recent decades, has caused the consumption of vast amounts of these products far from the places of their production, and the consequent permanent removal from the local soil of the plant constituents that they represent. The importance of mixed farming, and the raising of cattle, as a means of maintaining farm-land in good condition cannot well be over-emphasized. But even so, the shipment of milk and eggs to our cities means a partial removal of plant food; and ultimately the stock itself finds, in large part, a city market; while modern systems of drainage assure the final destruction of this material, so far as its agricultural value is concerned, in the form of sewage.

A complete plant food implies the presence of many other elements than nitrogen, phosphorus and potassium, but it is nevertheless recognized that these three take first place in importance so far as impoverishment of soils is concerned. Hence the values of all artificial fertilizers are stated in terms of them. There is no soil naturally so rich in these elements that it may not be exhausted insofar as one or other of them is concerned; while in the case of most soils that have been farmed for a series of years, without systematic replacement of the nitrogen, phosphorous or potassium removed by the crop, the impoverishment becomes evident to the most careless observer.

The intelligent purchaser of a fertilizer naturally desires to know the total amount of each component present in what is offered to him. It is probably true that, no matter in what form or combination nitrogen, phosphorus or potassium may be present in the fertilizer, it will ultimately, through those atmospheric and other influences that we comprehend under the term weathering, become available to plant nutrition. The period may however be a long one, and the farmer is not prepared to do business with a salesman who can guarantee availability only after an interval of many years. The term "available nitrogen" carries with it no persuasion unless it is understood to mean that the element in question will show results during the season of its application to the soil.

There can be no doubt that the word "available" is emphatically the selling word for fertilizers, and it is very desirable that it should carry a definite and legally recognized signification. It may mean that the plant nutrition supplied will show results in the earliest stages of growth, or later on in the season; but it is at least quite clear that the buyer expects to see results sometime during the season in which it is applied. The farmer who pays actual money for a fertilizer expects to see actual results in its use during the same year. I would suggest that the following definition of the term available, as applied to fertilizers be locally adopted:—

Available, means that quantum of the fertilizer content, which under

normal conditions of soil, weather and cultivation, will show results during the season in which it is used.

The problem of compounding a special fertilizer so that available nitrogen, phosphorus or potassium shall declare its effect upon the crop in the early part of the season, or during the whole course of the season, is one to be solved by the skill and knowledge of the manufacturer; and undoubtedly the manufacturer who succeeds best in meeting conditions desired by his customers will be rewarded by securing the largest market.

There remains the very serious question of ascertaining how, and to what extent, the nature of the numerous raw materials that may enter into the make-up of a fertilizer, lend themselves to definite statements of the availability (in the above sense) of their various content of nitrogen, phosphorus and potassium.

Since the elements named are taken up by the roots of the plant, and must be dissolved by water for that purpose, it seems pretty certain that, whatever proportions of total nitrogen, phosphorus and potassium are taken into solution by water applied directly to the fertilizer under conditions comparable to those of normal agriculture, may with reasonable certainty be accepted as available. In this sense the whole of the nitrogen entering into the composition of the fertilizer as nitrates or as ammonium salts or as cyanamide, must be regarded as available. So the phosphorus introduced as free phosphoric acid, or as soluble salts of phosphoric acid, will be available; and as practically all salts of potassium are soluble in water, this element introduced as the chloride or sulphate will be entirely available. Up to this point, we find little difficulty in furnishing the fertilizer manufacturer with rules to guide him in stating available nitrogen, phosphorus and potassium in a product whose composition is known to him.

But the named elements are in practice, introduced into most fertilizers in forms which, although not immediately water-soluble, become so through the action described above as weathering, or through the prolonged action of those slightly acid exudations characteristic of the root hairs of the plants themselves. Thus it has long been recognized that phosphorus introduced into the fertilizer as Di-calcic phosphate, although not immediately water soluble, becomes largely available during the season of growth, through imperfectly understood changes, more or less similar to those attributed to weathering. It has been held that a fairly accurate measure of the phosphorus so rendered available is found in the employment, in a definite manner, of neutral citrate of ammonium. Basic slags are known to contain more or less phosphorus in combinations that are insoluble in water, but which yield their phosphorus to plants under normal soil conditions during the season. Professor Wagner believed that a trustworthy way of measuring such available phosphorus consisted in the application of two per cent citric acid to the slag. The accuracy of this mode of measurement of such phosphorus has been called in question, and without any doubt, the method requires further study.

Doubtless more or less of the nitrogen, phosphorus and potassium existent in animal offal, tankage, blood, raw bone, proteid matters, gristle, peat, wood ashes, and the hundred and one materials that go into the manufacture of commercial fertilizers can be measured with satisfactory accuracy by the adoption of methods of work upon the material itself, although such methods are not yet described in our text books.

Just here lies a wide field of investigation requiring the intelligent and sympathetic co-operation of agriculturist and chemist; because the method finally adopted by the chemist must depend for its value and significance upon laboratory work done in parallel with

field experiment. In no other way can the trustworthiness of the chemist's modus be established. And until assured methods are finally worked out, no fertilizer should be permitted to claim, as available, more of its content of nitrogen, phosphorus or potassium than our present knowledge permits us to describe with certainty as available, in the sense above suggested for that term. Only by observing this principle can a feeling of confidence in use of fertilizers be developed; and my experience goes to show that there is great need of developing such conviction in the minds of Canadian farmers, if manufactured fertilizers are to hold the place that they should do in agriculture. Disappointment, through the failure of hopes based upon misrepresentation is not only the infliction of a serious and irremediable wrong done to the farmer, but prejudices his mind against that which, intelligently employed, may be the only thing that stands between success and failure in farming.

CANADA'S BIRDS

BY HARRISON F. LEWIS, CHIEF FEDERAL MIGRATORY BIRD OFFICER FOR ONTARIO AND QUEBEC

EACH of the various forms of animal and plant life in the world is endeavouring, consciously or unconsciously, not only to perpetuate its kind but to increase the existing number of individuals of its species. As a result, each form struggles with other forms, with which it comes into contact, for food, space, and other essentials of life. This struggle tends to fill all available positions in which life can exist, and to limit the increase of the various forms. The quasi-equilibrium now resulting from this opposition between the life-forms is termed the balance of nature. It is an unstable condition, in which movements, usually fluctuating, take place ceaselessly, but in general rather slowly.

Man, as one of the forms of life on the earth, is obliged to participate in the inter-specific conflict. At present our species enjoys advantage, because of the superior intelligence and the nimble and adaptable physical structure which it has developed. In the pressing of this advantage and the consequent continued shifting of balance in favour of our species, use is constantly made of assistance derived from the development or direction of the activities of other forms of life with which we are in contact. Among the forms which are thus useful to humanity the birds occupy a prominent place.

The relation of birds to agriculture through their feeding upon insect forms which destroy cultivated plants and injure domestic animals is of great importance. In Canada, where agriculture is the occupation of a very large part of the population, the assistance received from the birds by humanity through this relation is comparatively direct, yet it is but poorly realized. Mr. Arthur Gibson, Dominion Entomologist, has recently estimated that the annual loss in Canada to field, orchard, and garden crops, due to destructive insects, is more than $200,000,000. The consumption of insects by birds prevents this loss from being far greater. The fact that birds are very mobile forms enables them to congregate much more readily than can most organisms at points where food is most plentiful, that is (in the case of insectivorous birds), where insects most abound. Thus they perform exceptional service in preventing unduly rapid and unfavourable disturbances of the balance of nature by insects. Although they eat numbers of para-

sitic insects, and thus appear at times to exert pressure unfavourable to man, it is probable that even their destruction of parasitic insects, viewed as a part of their total activities, generally assists in maintaining such a beneficial balance as is most favourable for the expansion of our kind.

Some birds eat habitually such forms as field mice and other rodents, which are injurious to that part of man's food supply obtained from agriculture. Some eat and in part destroy the seeds of plants inimical to man's present interests. These birds bear, through their influence on agriculture, a relation to man essentially similar to that of the insectivorous birds, and their value to us is of the same kind, and proportionate to the nature and extent of their beneficial activities.

The most important relations of many arboreal insectivorous birds to humanity are through their influence, not on agriculture, but on forestry. Forests provide many things now necessary to the unchecked development of our species. These forests are always being attacked by insects, which would soon destroy them, to our great injury, were their natural expansive efforts successful. This consumption by birds is a very important part of the pressure which holds them in place. Here also the natural avian forces are being applied parallel to our own.

Still other wild birds, known as game birds, are of importance to humanity because of the food which they furnish directly, in their bodies, to mankind, and because the sport of hunting them is an attraction sufficient to lure great numbers of men to take physical exercise in the open air, which prolongs their lives and makes them more efficient. The value, expressed in dollars, of the human food obtained annually from game birds, is undoubtedly seldom realized. Reports received by the Department of Agriculture and Immigration of the province of Manitoba show 183,808 game birds killed in that province in 1920, including 139,216 wild ducks, 36,828 prairie chickens, 5,682 partridge (Ruffled Grouse), and 478 geese. Probably nearly an equal number of birds were killed but not reported, but if the total given be accepted, and the very low average value of fifty cents apiece be allowed for the birds, it appears that the game birds killed in Manitoba alone in 1920 were worth $91,904. Similar figures are, unfortunately, not available for the entire Dominion of Canada, but the game birds actually taken in the Dominion each year must be worth, as food, at least $1,000,000.

Birds also assist the development and expansion of the human species by restricting the spread of disease. This they do by acting as scavengers, as in the case of vultures and gulls, and by destroying disease-bearing insects, as is done by swallows, flycatchers, sandpipers, and others.

Some sea-bird colonies aid mankind by heaping up guano which is utilized to increase the agricultural production of food, and others are of use because by their cries they warn seafarers in foggy or stormy weather of the location of the rocks or sand-bars on which they live.

Because birds supply food for the nourishment of humanity and, by many of their activities, decrease resistance to the continuance and expansion of the human species, as well as because they appeal to the aesthetic and sentimental part of man's nature, it is in the interest of mankind that they shall be perpetuated in reasonable numbers. This now involves legal protection for many birds, because otherwise they would be seriously reduced in numbers or wholly destroyed for present profit, owing to the cupidity of many unsocial or ignorant human individuals.

In Canada the birds receive protection both from the provincial Governments and from the Dominion Govern-

ment. In the case of the Dominion Government this protection is given under authority of the Migratory Birds Convention Act and the regulations made thereunder. This Act is based upon a Convention between His Britannic Majesty and the United States of America, which was signed at Washington in 1916. The Act authorizes protection of various species of birds of which a greater or less number of individuals habitually migrate twice a year across the border between Canada and the United States. The protected birds are divided into three groups, viz., migratory insectivorous birds, migratory game birds, and migratory non-game birds. The insectivorous and non-game groups are afforded protection throughout the year. Certain of the game birds have been given a closed season for a period of years, but for most of the game birds there is a period, not exceeding three and a half months a year, in the autumn or winter, in which hunting is allowed, under certain restrictions.

As a result of the protection afforded by this Convention, the administration of the provisions of which is, in Canada, in the hands of the Commissioner of Dominion Parks, the protected species of birds have, in general, increased in numbers, and the satisfactory continuation of a plentiful supply of Canada's birds is, under present conditions, assured.

AMENDMENTS TO THE REGULATIONS UNDER THE DESTRUCTIVE INSECT AND PEST ACT

BY L. S. McLAINE, CHIEF DIVISION OF FOREIGN PESTS SUPPRESSION, ENTOMOLOGICAL BRANCH

ON February 10, 1922, the European Corn Borer quarantine placed on certain areas of the province of Ontario and known as Quarantine No. 2 (domestic), was revised and brought up to date. This revision quarantines the townships found infested by the European Corn Borer during the years 1920 and 1921. At the present time one hundred and six townships are covered by the quarantine which comprises an area of 8,214 square miles.

The quarantine reads as follows:—

"The fact has been determined by the Minister of Agriculture and notice is hereby given that an injurious insect, the European Corn Borer (*Pyrausta nubilalis* Hubner) new and not heretofore widely prevalent or distributed within and throughout the Dominion of Canada, exists in the province of Ontario, and that there is danger of this insect being spread into other districts by reason of the movement of corn plants or portions of plants infested with the pest.

"Therefore, His Excellency the Governor General in Council is pleased,—

"1. To order that the areas comprised in the following counties and townships be and they are hereby quarantined:—Brant county; Elgin county; the townships of Gosfield South, Mersea and Pelee in Essex county; Haldimand county; the townships of Goderich, Hay, Stanley, Stephen, Tuckersmith and Usborne in Huron county; the townships of Camden (including the Gore of Camden), Harwich, Howard, Orford, Raleigh, Romney, Tilbury east and Zone in Kent county; the townships of Brooke, Euphemia and Warwick in Lambton county; the townships of Clinton, Gainsborough, Grantham, Louth and Niagara in Lincoln county; Middlesex county; Norfolk county; the township of Pickering in Ontario county; Oxford county; the townships of Blanchard, Downie, Easthope North, Easthope South, Ellice, Full-

arton, Hibbert, Logan and Mornington in Perth county; Waterloo county; Welland county; the township of Guelph in Wellington county and the township of Ancaster in Wentworth county; all the aforementioned areas being in the Province of Ontario;

"2. To prohibit the removal of Corn Fodder or Corn Stalks including Broom Corn whether used for packing or other purposes, Green Sweet Corn, Roasting Ears, Corn On The Cob, or Corn Cobs, from the said quarantined areas to points outside those areas;

"3. To prohibit further the removal of the products mentioned under section two from the counties of Elgin and Middlesex to other points in the quarantined areas.

"This quarantine shall not apply under the following conditions:—

"1. To the articles enumerated when they shall have been manufactured or processed in such a manner as to eliminate all risk of carriage of the European Corn Borer.

"2. To clean shelled corn and cleaned seed of broom corn.

"3. To shipments of the articles enumerated transported through the quarantined areas on a through bill of lading.

"4. To shipments of the articles enumerated for experimental or scientific purposes by the Dominion Department of Agriculture or the Ontario Department of Agriculture.

"5. To shipments of dried seed corn on the cob for exhibition purposes and consigned to the Secretary of a winter fair or exhibition duly recognized by the Dominion Department of Agriculture or the Ontario Department of Agriculture. Such shipments shall be inspected at point of destination by an inspector duly appointed under the Destructive Insect and Pest Act.

"Any person who contravenes this quarantine will be prosecuted as provided for in the Destructive Insect and Pest Act.

"This order shall take effect forthwith and be in force until further notice."

It will be noted from the above that a double quarantine has been placed on the counties of Middlesex and Elgin, as these are the most heavily infested districts in the quarantined area. This will prevent the shipping of the products mentioned, and which are likely to be severely infested with the European Corn Borer, to the more lightly infested districts, and it is hoped in this way to retard the development of heavy infestations in the outlying sections of the quarantined area.

On March 21, 1922, four Orders in Council were passed dealing with the general regulations, and amending certain subsections of section 7, which prohibits the importation into Canada of certain plant products likely to be affected with serious insect pests or plant diseases. The Amendments together with Section 7 are as follows:—

"Section 7. The importation into Canada of the following is prohibited:—

"(*a*) Potatoes from Europe, Newfoundland, the islands of St. Pierre and Miquelon, and the states of California, Pennsylvania and West Virginia.

"All shipments of potatoes from the United States of America shall be accompanied by a certificate duly signed by the consignor stating the name of the state in which the potatoes were grown.

"(*f*) All species and varieties of currants and gooseberries (Ribes and Grossularia) but not including the fruits of these, from all foreign countries.

"Provided, however, that the importation of said vegetation shall be permitted without any restriction into the province of Ontario from the state of New York.

"(*h*) Corn and broom corn (including all parts of the plant), all sorghums, sudan grass, cut flowers or

entire plants of chrysanthemums aster, cosmos, zinnia, hollyhock, and cut flowers or entire plants of gladiolus and dahlia except the bulbs thereof without stems, oat and rye straw as such or when used for packing, celery, green beans in the pod, beets with tops, spinach and rhubarb, from the following counties in six of the United States of America:—

"Massachusetts: Barnstable, Bristol, Essex, Middlesex, Norfolk, Plymouth and Suffolk;

"Michigan: Monroe;

"New Hampshire: Rockingham;

"New York: (Eastern) Albany, Fulton, Hamilton, Montgomery, Rensselaer, Saratoga, Schenectady, Scoharie, Washington and Warren;

"New York: (Western) Cattaragus, Chautauqua, Erie and Niagara;

"Ohio: Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas and Ottawa;

"Pennsylvania: Erie;

unless the same are accompanied by a certificate of inspection issued by an authorized officer of the United States Department of Agriculture, which states that the shipment is free from infestation by the European Corn Borer.

"This prohibition does not apply to the plants enumerated when they shall have been manufactured or processed in such a manner to eliminate all risk of carriage of the European Corn Borer, nor to cleaned shelled corn nor to cleaned seed of broom corn.

"(*i*) Alfalfa (lucerne) hay, whether for feeding, packing or other purposes, originating in the areas hereinafter described: the counties of Delta, Dennison, Gunnison and Montrose in the state of Colorado; the state of Idaho; the counties of Ormsby, Storey, Washoe and White Pine in the state of Nevada; the counties of Baker and Malheur in the state of Oregon; the state of Utah; and the counties of Lincoln, Sweetwater and Unitah in the state of Wyoming.

"Provided, however, that this prohibition shall not extend to shipments of alfalfa (lucerne) hay transported through the areas described above on a through bill of lading.

"Provided, further, that all shipments of alfalfa (lucerne) hay consigned to the provinces of Manitoba, Saskatchewan, Alberta and British Columbia, shall be accompanied by a certificate, duly signed by the consignor, which shall state the county and state in which the alfalfa (lucerne) hay was grown."

Sections (*a*) and (*f*) will be administered by the division of Botany in cooperation with the Division of Foreign Pests suppression.

Section (*a*) dealing with the importation of potatoes was passed as a protective measure. Canada is free from the Potato Canker, and every precaution must be taken to keep it free. This disease has been found in Pennsylvania and West Virginia and these two states were added to the areas mentioned in the previous regulation.

Section (*f*) dealing with the importation of currants and gooseberries is also a protective measure. With the discovery of the White Pine Blister Rust on the Pacific Coast area of the United States, it was found necessary to close the Canadian border to all importations of vegetation carrying this disease. The importation of all species of pines susceptible to this disease has been prohibited for some years.

Section (*h*) restricts the importation of certain plants, cut flowers, vegetables, etc., from those areas in the United States infested by the European Corn Borer. This amendment brings the quarantine up to date and places an embargo on the localities found infested by this insect in 1921.

Section (*l*) dealing with the importation of alfalfa hay from areas infested by the Alfalfa Weevil, brings this embargo up to date and prohibits the importation of alfalfa hay from all the areas in the United States known to be infested by this pest. The Alfalfa Weevil is a very serious pest of alfalfa and all precautions must be taken to prevent its introduction into the alfalfa growing districts in Canada.

AMENDMENT TO THE APPLE SUCKER QUARANTINE IN NOVA SCOTIA

The apple sucker was first discovered in the vicinity of Wolfville, Nova Scotia, during the summer of 1919. To prevent the spread of the insect into new territory on shipments of infested nursery stock, it was necessary to place a quarantine on the affected district in the fall of the same year. During the summers of 1920 and 1921, scouting work was carried on in co-operation with the Nova Scotia Department of Agriculture to determine the spread of the insect.

This past summer it was found that the insect had spread into the county of Halifax, and on November 15, 1921, a ministerial order was passed, prohibiting the removal of nursery stock unless the same was accompanied by a certificate of inspection or a permit.

The order reads as follows:—

AMENDMENT No. 2 TO QUARANTINE No. 1 (DOMESTIC)

Ministerial Order Quarantining certain Areas on account of the Apple Sucker

"The fact has been determined by the Minister of Agriculture from reports submitted by inspectors of the Entomological Branch, that an injurious insect, the apple sucker, (*Psyllia mali* Schmidt) has been found in the county of Halifax, province of Nova Scotia.

"Now, therefore, I, Joseph Hiram Grisdale, the Deputy of the Minister of Agriculture for the Dominion of Canada, under authority conferred upon me by Section 7 of the Destructive Insect and Pest Act, 9-10 Edward VII, Chap. 31, do hereby quarantine the county of Halifax, Province of Nova Scotia, on account of the apple sucker, and until further notice the regulations effective under Quarantine No. 1 (domestic) passed on August 21st 1920, shall apply in all respects to the said county.

"This amendment shall take effect immediately and be in force until further notice.

"Witness my hand this date and the seal of the Department of Agriculture, Canada.

"(Seal)

"(Sgd.) J. H. GRISDALE,
Deputy Minister of Agriculture.
"Date: Nov. 15, 1921.

IMPORT REGULATIONS FOR WOOL, HAIR, HIDES, ETC.

The attention of importers of foreign Hides and Skins, Wool and Hair is directed to the new regulations issued in that behalf by Order in Council and in virtue of "The Animal Contagious Diseases Act." These regulations supersede all previous ones in regard to these products. They become effective on May 1. Copies may be obtained from the Veterinary Director General, Health of Animals Branch, Department of Agriculture, Ottawa.

NEWS ITEMS AND NOTES

Mr. H. T. Güssow who, previous to the war was officially known as Dominion Botanist, will in future be recognized by that title. Acting on the report of the Civil Service Commission to the effect that the provisions of the Civil Service Act relating to suspensions were never given effect by Order in Council, the Minister of Justice has ruled that Mr. Güssow retains his official designation.

Dr. J. H. Grisdale, Deputy Minister of Agriculture and Mr. H. S. Arkell, Live Stock Commissioner, represented the Dominion Department of Agriculture at the conference held at Saskatoon, Sask., in March last to discuss plans for the further development of the Canadian Live Stock industry and co-ordination of policy.

Arrangements have recently been made by the Dominion Minister of Agriculture whereby practising veterinarians will be enabled to take part in the accredited herd work now being carried on by the Health of Animals Branch of that Department. By thus augmenting its regular staff, the Department hopes to proceed more rapidly with the testing of herds for tuberculosis than has been possible hitherto, and thus keep pace with the increasing demand. Veterinarians who desire to take part in this work will be enrolled on the approved list after passing the examination prescribed by the Civil Service Commission, and becoming familiar with the technique under the supervision of a regular inspector. Those who have already passed the examination will be eligible on taking the prescribed training. Veterinarians on the approved list will not only be available for herd testing, but also for emergency work, as well as for permanent appointment when vacancies occur, provided they are under the age of 41 years.

While the difficulties to be overcome and the objections to be met were not overlooked at the Ottawa dairy conference, the consensus of opinion was that the proposed grading and standardization of butter and cheese would be a move in the right direction, and would have a beneficial effect in stabilizing the trade with Great Britain and other countries. Emphasis was laid upon the advance in quantity and quality of the dairy products exported by New Zealand, Denmark, and other lands, and it was agreed that if Canada is to meet the increased competition that has arisen, she must take this forward step. The Department is now organizing a qualified staff of graders. When that is done, the regulations adopted under the Dairy Produce Act will come into force.

As the Dairy and Cold Storage Commissioner of the Dominion Department of Agriculture states, the development of the dairying industry in New Zealand during the last twenty years is of great significance to Canada. In 1904 that country exported 35,203,728 lbs. of butter and 9,691,920 lbs. of cheese. Seventeen years later it exported 72,894,752 lbs. of butter and 151,588,304 lbs. of cheese. This enormous increase of over a hundred per cent in one instance and fifteen hundred per cent in the other is attributable to management, industry, and climatic and pastoral conditions, and to the fact, in the case of cheese, that their product is better seasoned on landing than our own. The last fact the Commissioner is inclined to attribute in a measure to the greater distance the cheese has to be carried, and to the care that is taken in temperature during transportation.

"We should never forget that our great market is at our own doors," comments J. A. Ruddick, Dairy Commissioner, in summarizing the dairy outlook in this country. "We export only about one-fifth of our total production. The annual consumption of milk and its products in Canada is equal to about 1,000 pounds of milk annually per capita. If our population should grow at the rate of 100,000 per year there will be required annually an additional 100,000,000 pounds of milk to supply them. Newer knowledge of nutrition is increasing milk consumption here, as it is everywhere."

According to the Dominion Live Stock Commissioner, Canada's exports of bacon to Great Britain declined from 1,493,000 long hundredweight in 1920 to 844,000 in 1921. Danish exports during the same period increased from 745,000 to 1,849,000 long hundredweight.

In an attempt to induce farmers to grow the type of hog required to make first quality bacon, which alone will enable the Canadian packer to meet competition, the Dominion Department of Agriculture will institute a system of grading hogs so that those of the right breeding, weight, quality, and finish, may command a premium. On their part the packers have agreed to pay a discrim-

inating price, and thus encourage production of the types desired.

The recommendations made for the protection of crops of all kinds from the ravages of injurious insects and plant diseases is worth many hundreds of thousands of dollars every year to Canada, according to the Dominion Entomologist. This advice is based on the work of scientific investigators and a rough estimate of the actual saving resulting from its adoption in 1919 and 1920 is as follows: Grasshopper control, 1919 and 1920, $20,000,000; forest insects in British Columbia yellow pine, $6,000,000; apple crop, by use of new copper arsenic dust, $20,000 in 1920; by substitution of arsenate of lime for arsenate of lead, $16,200 in 1920; by adoption of Thomson bordeaux mixture and dusting in place of lime-sulphur spray in Nova Scotia apple orchards, $400,000; control of cabbage root maggot by the use of corrosive sublimate in Ontario, $50,000 in 1920; control of Rose midge by use of tobacco dust, in Ontario, $50,000 in 1920.

Returns have been compiled by the Poultry Division of the Dominion Live Stock Branch, as to the amount of business transacted by egg circles in Ontario during the first quarter of each year of the period 1915-1921, of which the following is a summary:—

Year	No. of members	Quantity shipped (dozens)	Gross Value to circle	Net Value to members
			$	$
1915	251	13,341	3,823.16	3,538.98
1916	479	34,640	10,564.19	10,439.84
1917	600	35,346	14,872.62	14,195.26
1918	888	44,309	23,052.00	21,813.39
1919	1,468	97,475	45,016.91	43,038.03
1920	1,065	57,711	36,557.47	34,886.23
1921	1,622	99,310	45,661.75	43,165.45

The Ontario Veterinary College, affiliated with the University of Toronto, is one of the oldest and most favourably known institutions of the kind on the American continent. It has received students from all parts of the English-speaking world, and its graduates are highly regarded, many of them having attained considerable prominence. It was first established at Toronto in 1862 as a private enterprise, and during the year 1908 was acquired by the Province of Ontario.

After carefully considering the essential requirements of veterinary education, training and practice, the Ontario Government, on the advice of the Minister of Agriculture, decided a year or two ago to transfer the institution from Toronto to Guelph. A suitable site was provided, and the erection of the new college buildings, begun during 1921, has now been completed. The location, buildings and equipment combine in making what is generally considered to be one of the finest institutions of the kind. Being situated on "College Heights," adjacent to the Ontario Agricultural College and Experimental Farm, the representative collection of stock there maintained is available for instructional purposes, thus providing for greater expansion in the course of instruction.

Statistics as to dairying in the Province of Quebec show a considerable increase in the manufacture of butter and cheese in 1921 as compared with 1920. There were 674 creameries in operation, with 600,160 cows supplying them. The butter output was 42,575,392 pounds having a value of $15,431,962 as compared with 41,632,511 pounds in 1920. The cheese production amounted to 53,525,706 pounds valued at $8,188,983; increase 1,362,935 pounds.

A total of 164 persons, 112 men and 52 women, registered for the Winter Short Course, 1921-22 at Macdonald College. The registration by courses was as follows:

Course	Men	Women	Total
Home Gardening for Amateurs, Feb. 13 to 20 inclusive	22	22	44
Animal and Cereal Husbandry, Feb. 20 to 24 inclusive	29	0	29
Poultry, Feb. 20 to 24 inclusive	65	32	97
For Gardeners and Fruit Growers, Feb. 28, Mar. 1 and 2	15	4	19

During May a live stock improvement train, carrying Manitoba-raised pure-bred bulls of the leading breeds, will visit Manitoba points, under the direction of the Manitoba Department of Agriculture. The department will assist farmers in the purchase of pure-bred bulls, and will accept scrub bulls in exchange. The train will be equipped with motion picture machines, literature and demonstration cars.

During 1921 a total of 284 school exhibitions were held in the province of Saskatchewan. In the same period 64 Boys' and Girls' Clubs were active, their membership in 1920 totalling 1,098 and in 1921, 3,865. These clubs are active in the rearing of calves, pigs, sheep, colts and poultry, potato growing, gardening, canning, and stock judging.

The Agricultural Instruction Trains operated in 1921 by the Saskatchewan Department of Agriculture were as follows: Agricultural Instruction Cars, January 17 to March 26, attendance 12,265; Interprovincial Weed Train, February 7 to 19, attendance 4,857; Better Farming Train, May 30 to July 2, attendance 32,774; Agricultural Instruction Cars, June 27 to July 27, attendance 4,327. These four enterprises cost the province, in the order named: $2,115.56; $1,599.44; $12,876.59; and $1,543.22. The railways supplied the equipment free of charge. The special trains were operated free of charge for a period of seven weeks. The railways also paid one-half of the advertising cost and furnished transportation for the staff of both trains and cars.

There are at present 187 Rural Education Associations in Saskatchewan, of which 170 held school exhibitions in 1921. The following figures show the growth of these Associations in numbers: 1916, 38; 1917, 57; 1918, 83; 1919, 118; 1920, 153.

During 1921 there were approximately 7,085,000 pounds of creamery butter manufactured in Saskatchewan. Of this amount 5,546,946 pounds or 78·3 per cent was graded by the official government graders. Regular butter grading depots are maintained at Regina and Saskatoon.

The grade certificate and the grading service furnish the creamery operator with an exact record of the work being done by each butter-maker, showing in detail all defects found in the butter.

Selling under Government grade certificate the manufacturer is in a position to ask the highest market price being paid for the various grades.

Fifty-nine herds in the Province of Saskatchewan have been under regular test for production of milk and butterfat since the work was taken over by the Provincial Department of Agriculture on May 1, 1921. This is an increase of 29 herds or 96·6 per cent over the number under test during the same period in 1920.

It is planned to develop this work further in a number of ways. In co-operation with the Saskatchewan Dairy Association, competitions are being conducted where awards will be offered for the highest average production per cow in whole herds and also for the highest individual records made by pure bred cows.

Through Boys' and Girls' Clubs it is planned to stimulate an interest in testing work and thus in herd management and herd improvement. The Saskatchewan Dairy Association offers prizes to boys or girls under sixteen years of age for the best kept herd record book. "Cow testing" is announced by the Director of Rural Educational Associations as a definite item on the programme of Boys' and Girls' Club work for 1922.

During the current year the following films were released by the Saskatchewan government: Nation Building in Saskatchewan; Household Science in Saskatchewan Schools; Farm Boys' Camps; Saskatchewan's Fight; the Provincial Sanatorium at Fort Qu'Appelle; Marketing Eggs; Grading Stallions; Selecting a Dairy Cow; Tree Planting; Better Bulls.

The government now owns twenty-six of these educational films, which were shown, without charge, during the current year to 51,182 persons.

At the annual convention of the Saskatchewan Dairymen's Association a resolution was adopted recommending the institution of a Chair of Co-operation and Markets at the University of Saskatchewan.

The Factory Class at the Ontario Agricultural College Dairy School in 1922 has been the largest for a number of years. Sixty-one students wrote on the final examinations. This is partly accounted for by the fire which destroyed the Eastern Dairy School at Kingston early in January, causing 24 members of that class to come to Guelph, of whom 22 wrote on the finals.

The number of registrations by Courses was as follows: Factory Course, 69; Farm Dairy, 17; Ice-cream and Soft Cheese, 19; Cow-testing, 27; Special Creamery Course, 54; Total, 186.

ASSOCIATIONS AND SOCIETIES

Ontario Seed Growers' Association.—Hon. President, W. J. Squirrel, Guelph; President, R. R. Moore, Norwich; Vice-President, J. W. Sangster, Listowel; Secretary, F. C. Hart, Toronto.

Ontario Corn Growers' Association.—Hon. President, Lester Gregory, Chatham; President, Stewart McDonald, Port Lambton; 1st Vice-President, Frank Weaver, Turnerville; 2nd Vice-President, Fred Ure, Maidstone; Secretary, W. H. Smith, Chatham.

Ontario Cattle Breeders' Association.—President, John Gardhouse, Weston; Vice-President, W. E. Thompson, Woodstock; Secretary, R. W. Wade, Toronto.

Ontario Horse Breeders' Association.—President, John A. Boag, Queensville; Vice-President, John Gardhouse, Weston; Secretary-Treasurer, J. E. Rettie, Toronto.

Ontario Berkshire Breeders' Society.—President, Adam Thompson, Stratford; Secretary, J. E. Rettie, Toronto.

Ontario Sheep Breeders' Association.—Secretary, R. W. Wade, Toronto.

Poultry Producers of Ontario.—President, Lewis N. Clark, Port Hope; Vice-President, Col. Thomas G. Delamere, Stratford; Secretary, Geo. W. Miller, Toronto.

Canadian Ayrshire Breeders' Association.—President, Gilbert McMillan, Huntingdon, Que.; Vice-President, J. L. Stansell, Stratford, Ont.; Secretary-Treasurer, W. F. Stephen, Huntingdon, Que.

Canadian Shire Horse Association.—President, G. E. Morden, Oakville, Ont.; Vice-President, W. J. Gardhouse, Weston; Secretary-Treasurer, G. deW. Green, Toronto.

Canadian Hereford Breeders' Association.—President, L. O. Clifford, Oshawa, Ont.; Vice-President, Walter Readhead, Milton; Secretary-Treasurer, H. D. Smith, Ancaster.

Canadian Swine Breeders' Association.—President, M. Ste. Marie, Compton, Que.; Vice-President, J. E. Brethour, Burford, Ont. Secretary-Treasurer, J. E. Rettie, Toronto.

Canadian Aberdeen-Angus Association.—President, Jas. Browne, Neudorf, Sask.; Vice-President, G. C. Channon, Beauport, Ont.; Secretary-Treasurer, F. G. Crawford, Brandon, Man.

Canadian Co-operative Wool Growers' Association.—President, Lt.-Col. R. McEwen, Bryson, Ont.; General Manager, G. E. O'Brien, Toronto, Ont.

Canadian Pony Society.—President, Dr. W. J. R. Fowler, Toronto; Vice-President, J. E. Chandler, Hudson Heights, Que.; Hon. President, J. M. Gardhouse, Weston, Ont.; Secretary-Treasurer, G. deW. Green, Toronto.

Canadian Jersey Cattle Club.—President, G. D. Duncan, Todmorden, Ont.; 1st Vice-President, F. E. M. Robinson, Richmond, Que.; 2nd Vice-President, J. M. Dolson, Brampton; Secretary-Treasurer, B. A. Bull, Brampton.

Canadian Hackney Horse Society.—President, Dr. W. J. R. Fowler, Toronto; Vice-President, H. A. Mason, Scarborough.

Thoroughbred Horse Society.—President, J. J. Dixon, Toronto; Vice-President, A. F. Dyment, Toronto; 2nd Vice-President, R. M. Dale, Toronto; Secretary-Treasurer, T. J. McCabe, Toronto.

The Clydesdale Horse Association of Canada.—President, Dr. T. H. Hassard, Markham, Ont.; Vice-President, Walter Scott, Sutton West, Ont.; Secretary-Treasurer, J. W. Wheaton, Toronto.

Dual-Purpose Shorthorn Association.—President, G. L. Smith, Meadowvale; Vice-President, Ross Martindale, Caledonia; Secretary-Treasurer, I. B. Whale, London, Ont.

Dominion Shorthorn Breeders' Association.—Hon. President, J. G. Barron, Carberry, Man.; President, H. M. Pettit, Freeman, Ont.; 1st Vice-President, Duncan Marshall, Olds, Alta.; 2nd Vice-President, John Gardhouse, Weston, Ont.; Secretary-Treasurer, Geo. E. Day, Guelph, Ont.

Holstein-Friesian Association of Canada.—President, A. E. Hulet, Norwich, Ont.; 1st Vice-President, R. W. E. Burnaby, Jefferson, Ont.; Secretary, W. A. Clemons, Brantford, Ont.

Yorkshire Breeders' Club.—President, H. A. Dorrance, Orangeville; Vice-President, D. L. Lerch, Preston; Secretary-Treasurer, J. E. Rettie, Toronto.

New Brunswick Fruit Growers' Association.—President, W. B. Gilman, Fredericton; Secretary-Treasurer, A. G. Turney, Fredericton.

New Brunswick Beekeepers' Association.—President, George L. Pugh, Nashwaaksis; Secretary-Treasurer, H. G. Miller, Fredericton.

Nova Scotia Poultry Association.—President, W. W. Osborne, New Glasgow; Secretary, J. P. Landry, Truro.

Alberta Cattle Breeders' Association.—Hon. President, Hon. George Hoadley, Minister of Agriculture for Alberta; President, G. H. Hutton, Calgary; First Vice-President, John Wilson, Innisfail; Second Vice-President, J. F. Day, Red Deer; Secretary-Treasurer, E. L. Richardson, Calgary.

Alberta Provincial Poultry Association.—President, Joseph Shackleton, Edmonton; Secretary, P. J. Timms, Calgary.

Alberta Hereford Breeders' Association.—President, John McD. Davidson, Coaldale; Secretary-Treasurer, Thomas Bellew, Calgary.

Manitoba Dairy Association.—President, E. Fotheringham, Brandon; Secretary-Treasurer, L. A. Gibson, Winnipeg.

Manitoba Poultry Breeders' Association.—President, N. W. Kerr, Brandon; Secretary, W. F. McGuinness, Brandon; Treasurer, J. F. McLean, Brandon.

Saskatchewan Ayrshire Breeders' Club.—President, W. H. Mortson, Fairlight; Secretary-Treasurer, E. Rogers, Lashburn.

Saskatchewan Holstein Breeders' Club.—President, B. H. Thompson, Boharm; Vice-President, W. H. Acres, Qu'Appelle; Secretary-Treasurer, C. W. Thurston.

British Columbia Dairymen's Association.—Hon. President, A. C. Wells, Sardis; President, P. H. Moore, Essondale; Vice-President, Mackintyre Dean, Keatings, B.C.

British Columbia Goat Breeders' Association.—President, W. H. Cottrell, Vancouver; Vice-President, C. H. Unwin, Victoria; Secretary-Treasurer, Geo. Pilmer, Dept. of Agriculture, Victoria.

British Columbia Ayrshire Breeders' Association.—Honorary President, A. C. Wells, Sardis; President, E. A. Wells, Sardis; Secretary-Treasurer, Prof. H. M. King, Vancouver.

British Columbia Entomological Society.—President, L. E. Marmont, Maillardville; Vice-President, R. S. Sherman, Vancouver; 2nd Vice-President, M. H. Ruhman, Vernon; Secretary-Treasurer, R. Glendenning.

Niagara District Grape Growers Limited—President, G. A. Welstead, St. Catharines, Ont.; Vice-President, F. B. Cole, Louth; Secretary, W. C. Thompson, Beamsville, Ont.

Niagara Peninsula Growers Limited.—President, T. J. Mahony, Grimsby, Ont.; Vice-President, A. A. Craise, St. Catharines, Ont.; Secretary-Treasurer, G. G. Bourne, Grimsby, Ont.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Experimental Station, Lacombe, Alta., 1920-21.—Report of the Superintendent, F. H. Reed, B.S.A.; Dominion Experimental Farms Branch.

Experimental Station, Lethbridge, Alta., 1920-21.—Report of the Superintendent, W. H. Fairfield, M.S., Dominion Experimental Farms Branch.

Bran, Shorts, Middlings and Feed Flour.—An Investigation Towards Revised Standards. By Frank T. Shutt, M.A., D.Sc., Dominion Chemist, and S. N. Hamilton B.A., Associate Chemist, Dominion Experimental Farms. Bulletin No. 2—New Series.

Record of Performance for Poultry Section "A," 1920-21.—Poultry Division, Live Stock Branch. The 1920-21 entries totalled 7,511 birds entered by 81 breeders, and of the 7,403 birds banded, 1,942 qualified for Record of Performance certificates, and 287 for Record of Performance advanced certificates. These figures show an increase over 1919-20 of 20·9 per cent in the number of breeders and 69·5 per cent in the number of birds entered.

ONTARIO

Ontario Fruit Growers' Association.—Fifty-second Annual Report, 1920.

Ontario Beekeepers' Association.—Forty-first Annual Report, 1920.

Beef Rings.—Circular No. 39. Co-operation and Markets Branch.

BRITISH COLUMBIA

Goat Raising in B.C.—Bulletin No. 64—Third Edition—Live Stock Branch.

Blackberry Culture.—Circular No. 57—New Horticultural Series.

Strawberry Culture.—Circular No. 58—New Horticultural Series—By E. W. White, District Horticulturist.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE, OTTAWA.

Plant Habits and Habitats in the Arid Portions of South Australia, by W. A. Cannon. Washington, Carnegie Institution, 1921. 139 pp. ill. (Publication 308). Bibl. pp. 138-9.

The Behaviour of Stomata, by J. V. G. Lotfield. Washington, Carnegie Institution, 1921. 104 pp. ill. (Publication 314) Bibl. pp. 103-4.

Shakespeare for Community Players, by Roy Mitchell. Toronto, J. M. Dent & Sons, ltd. 1919. 142 pp. ill.

Agricultural bacteriology, by J. E. Greaves, M.S., Ph. D. New York, Lea & Febiger, 1922. 437 pp. ill.

Glue, gelatine and Their Allied Products, by Thomas Lambert. London, Charles Griffin & Co., ltd., 1920. 153 pp.

Amelioration des plantes cultivees et du betail, par E. Coquide. Paris, J. B. Bailliere & fils, 1920. 607 pp. ill.

Guide to the Study of Animal Ecology, by G. C. Adams, Ph.D. Toronto, Macmillan Co. of Canada, 1913. 183 pp., ill.

The Vitamine Manual, by W. H. Eddy. Baltimore, Williams & Wilkins Co., 1921. 121 pp.

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Land Drainage, by W. L. Powers and T. A. H. Teeter. New York. Wiley, 1922. 27 pp. ill.

Farm Buildings, by W. A. Foster, B.Sc., and D. G. Carter, B.S. New York, Wiley, 1921. 377 pp., ill.

Allen's Commercial Organic Analysis, ed. by Henry Leffmann and W. A. Davis London, J. and A. Churchill. 9 vols., ill.

History of the Frozen Meat Trade, by J. T. Critchell and Joseph Raymond. London, Constable, 1912. 442 pp., ill.

Bleaching, by S. H. Higgins, M.Sc. New York, Longmans, Green & Co., 1921. 137 pp.

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Export Packing, by C. C. Martin and others. Boston, Johnston export publishing Co., 1921. 723 pp. ill.

Market Analysis; Its Principles and Methods, by Percival White, A. M. New York. McGraw-Hill Co., inc. 1921. 340 pp.

Marketing Methods and Policies, by P. D. Converse. New York, Prentice-Hall, inc. 1921. 650 pp.

Marketing Agricultural Products, by B. H. Hibbard, Ph.D. New York, D. Appleton & Co., 1921. 389 pp.

Critical microscopy, by A. C. Coles, M.D., D.Sc. London, J. & A. Churchill, 1921. 100 pp. ill.

An Introduction to the Structure and Reproduction of Plants, by F. E. Fritsch, D.Sc. London, G. Bell & Sons, 1920. 458 pp. ill.

The Natural History of Plants, tr. from the German of A. K. von Marilaun, by F. W. Oliver, M.A., D.Sc. London, Gresham Publishing Co., 1895. 2 vols.

Strasburger's Textbook of Botany, rewritten by Dr. Hans Fitting, 5th ed. revised by W. H. Land, D.Sc. Toronto, Macmillan Co. of Canada, 1921. 800 pp. ill.

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Nutrition de la plante; echanges d'eau et de substances minerales, by M. Molliard. Paris, Librairie Octave Doin, 1921. 395 pp.

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Organic Evolution; Outstanding Difficulties and Possible Explanations, by Major Leonard Darwin. Cambridge, University Press, 1921. 47 pp.

Laboratory Manual in General Microbiology, 3d ed. New York, John Wiley & Sons, 1921. 472 pp.

The Peanut Plant, by B. W. Jones, N.Y. O. Judd Co., 1885.. 69 pp. ill.

Quince culture, by W. W. Meech. New York, O. Judd Co., 1896 180 pp. ill.

Cranberry culture, by J. J. White. N.Y. O. Judd Co. 1885. 131 pp. ill.

How to make an orchard in British Columbia, by J. T. Bealby. London, A. & C. Black, 1912. 86 pp.

Rural community organization, by A. W. Hayes. Chicago, University of Chicago press, 1921. 128 pp.

The economic history of China, by Mabel Ping-Hua Lee. New York, Longmans, Green & Co. 1921. 461 pp.

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An introduction to English rural history, by George Guest. London, Central book room, 1920. 68 pp.

Farm Sewage, by E. M. Santee. N.Y. O. Judd Co. 1912. 32 pp. ill.

The structure of Wool Fibre, by F. H. Bowman. Toronto, Macmillan Co. of Canada, 1908. 475 pp. ill.

The History of Wool and Woolcombing, by James Burnley. London, Sampson, Low, Marston, Searle & Rivington, 1889. 487 pp. ill.

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Wool and Cotton in All Forms From Yarn to Fabric. New York, William Whitman Co., 1921. 177 pp. ill.

Inspection des viandes et des aliments d'origine carnee, by M. Piette. Paris, J. B. Bailliere & fils, 1921. 439 pp. ill.

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A Manual of Photographic technique, by L. J. Hibbert. Toronto, Sir Isaac Pitman & Sons, 1921. 118 pp. ill.

Manual of Tropical and Sub-Tropical Fruits, by W. Popenoe. Toronto, Macmillan Co. of Canada, 1920. 474 pp. ill.

La taille des arbres fruitiers de plein vent, by E. Rabate. Paris, Librairie agricole de la maison rustique. 165 pp., ill.

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Langstroth on the Hive and Honeybee; 21st ed. rev. by C. P. Dadant. Hamilton, American bee journal, 1922. 436 pp., ill.

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History of the Poland China Breed of Swine. Omaha, Poland China history Association, 1921. 278 pp. ill.

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PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

CROPS AND CULTIVATION

245.—**Development of Agricultural Meteorology in the United States.**—WARREN SMITH, J., in *Monthly Weather Review*, Vol. 48, No. 5, pp. 281-283. Bibliography of 46 works, Washington, May, 1920.

The present U.S. Weather Bureau was inaugurated by an act of Congress on February 9, 1870, authorizing the Secretary of War to organize a meteorological service throughout the United States.

The Iowa Weather Service was established in 1875; the Nebraska Service in 1878, the Missouri Service in 1877, and the Ohio Service in 1882.

By 1891 a special weather and crop service was in operation in nearly every state; the publication of Weather and Crop Bulletins was already started in 1887.

On July 1, 1891, all the meteorological work of the Signal Service was transferred to the Department of Agriculture and the present United States Weather Bureau was put into operation. Since this transfer, the work of the Weather Bureau in its relation to agriculture has developed steadily, and special services have been established for the direct benefit of areas devoted to maize and wheat, cotton, sugar and rice, cattle, tobacco and fruit.

Special forecast and warning services have been inaugurated for tobacco, fruit and truck growers; alfalfa and rice harvesting; fruit spraying, alfalfa seed harvest and sheep shearing, etc.

The present Division of Agricultural Meteorology was established as a new division in the Weather Bureau on February 23, 1916 (1). The National Weather and Crop Bulletin has been developed to show the effect weekly upon growing crops, and studies are being made to find the most critical period of growth of the various crops and the weather most affecting them. Detailed temperature and moisture surveys are being carried on in citrus and deciduous orchards to determine the distribution of damaging weather factors, the effect of orchard heating on the temperature, and the part that radiation plays in temperature variations and fruit protection.

Valuable studies in the forecasting of minimum temperatures have been published and equations evaluated from the knowledge of the moisture in the atmosphere in the afternoon and its relation to the temperature variations during the following night.

246.—**Apparatus for Protection from Frost in the United States.**—KIMBALL, H. H., and YOUNG, F. D., in *Monthly Weather Review*, Vol. 48, No. 8, pp. 461-462. Washington, August, 1920.

There are three quite different types of oil burning heaters in general use on the Pacific Coast.

(1) High stack heater, with an abundant draught, resulting in almost complete combustion of the oil, and the formation of only light smoke;

(2) Lard-pail heater, with insufficient draught for complete combustion and a dense smoke.

(3) Short-stack heater, intermediate.

Which of these three types is to be preferred? The experiments conducted at the Stations of Pomona, Cal., and at Medford, Ore., are very interesting in this respect. The results obtained may be summarized as follows:—

(1) The presence of a dense smoke cloud diminished nocturnal radiation on an average about 0·011 calories per minute per sq. cm. of surface, with maximum effects of nearly 0·030 calories.

(2) At a distance of 10 ft., the intensity of radiation from a lard-pail heater is about 0·080 calories per minute per sq.cm.; from a short stack, about 0·100 calories; from a high stack, 0·300 calories.

(3) Since the intensity of radiation varies inversely as the square of the distance from the source of heat, at a distance of 15 ft. from the heaters it will be less than half at 20 ft., *i.e.*, about ¼ that given above.

(4) The heating by radiation is in addition to the heating by conduction and convection

(1) A Division of Agricultural Meteorology was established by the Canadian Weather Bureau at the instance of the International Agricultural Institute in 1914.

of hot air and gases from the burning oil in its immediate vicinity.

It may therefore be concluded that the retardation of nocturnal radiation by the smoke cloud plays an insignificant part in frost protection. The important point is the heat which emanates directly from the radiators; high stack heaters may therefore be recommended. These possess the advantage of avoiding the production of dense smoke clouds which might prove decidedly disagreeable in a populated area.

363.—**Theory of Injury Due to Freezing of Fruit Buds From the Protection Standpoint.**—West, F. L., and Edlefsen, N.E., in *Journal of Agricultural Research*, Vol. XX, No. 8. Washington, D.C., January 15, 1921.

Introduction.—The late spring frosts and the early autumn frosts cause damage to the extent of several millions of dollars annually in the United States. The commonest method of protection is to heat by burning oil in pots distributed through the section that is endangered. This method is resorted to on a large scale in the citrus fruit sections of California, and less frequently elsewhere for the protection of such fruits as apples, peaches, and cherries.

The success of this practice depends on the economical use of fuel and labour, and it can only be employed in cases of urgent need.

If the predicted minimum temperature is lower than the "critical temperature" or if the predicted minimum temperature is above the "critical temperature," in both cases it is useless to light the heaters.

It is, therefore, indispensable to know first the degree of resistance of the fruit trees at various stages in their development. Thanks to the previous investigations made by other authorities, it has been possible to draw up a classified list of the "danger points" for various kinds of fruit:—

(1) At the time when the petals are closed but showing colour:—apple 25° F. to 27° F.; peach 20° F. to 29° F.; cherry 22° F. to 29°F., pear 25° F. to 29° F., plums and apricots 22° F. to 30° F.

At time of blossoming: apple and pear 28° F. to 29°F., peach 27°F. to 30°F., cherry 28°F. to 30°F., apricot and plum 28°F. to 31° F.

Fruit setting: apple and cherry, 28° to 30°; peach 27° to 30°; pear 28° to 29°; plum 28° to 31°; apricot 28° to 32°.

This paper gives the methods used and the results obtained by freezing on 24,000 fruit buds, most of them being apples and peaches, and also observations on the spring temperatures and yields of fruit in orchards near Logan, Utah (1913 to 1920).

Methods Employed.—(1) Detaching branches with fruit buds in the laboratory by means of a specially designed thermostat, the air surrounding the buds being cooled by means of common salt and ice. The extent of the injury was determined by cutting the buds open and counting those that had been damaged and then calculating the percentage frozen.

(2) Branches of trees were bent down into a vessel surrounded by a second air chamber; the latter being surrounded by a mixture of ice and salt. The minimum temperature was noted, the branch tagged, and the further development of the buds was observed and the yield of fruit determined.

(3) Modified method No. 2. Instead of using ice and salt, the buds were cooled by means of evaporating liquid carbon dioxide which in a very cold gaseous condition cooled the buds to the desired temperature.

(4) Freezing the whole tree by surrounding and covering it with a 2-walled metal vessel containing ice and salt.

The factors that determine the amount of damage done are:

(1) Kind of buds.
(2) Stage of development.
(3) Minimum temperature.
(4) Humidity.
(5) Duration of frost.
(6) Rate of thaw.

Results.—General conclusions may be drawn after examination of the numerous experimental data collected in this way.

(1) Ben Davis apples in full bloom have experienced temperatures of 25°, 26° and 27° F. without injury, and 25° kills about ½ and 22 F. about 9/10. On several occasions, however, apples matured on branches at a temperature of 20° F.

(2) With Elberta peaches in full bloom, 29°F. or above are safe temperatures. A temperature of 28° F. will kill from ¼ to ½; 26°F. kills ½ and 22°F. about 9/10.

(3) With sweet cherries in full bloom, 30°F. is the safe temperature, but 29°F. usually kills about ¼ and 25°F. about ½.

(4) Sour cherries are hardier than the sweet varieties in full bloom; 26° F. killed only ⅕, and 22°F. only ⅖ of them. When the buds were showing colour 23°F. did not harm them.

Sour cherries are the hardiest, and then follow in order apples, peaches, apricots and sweet cherries.

(5) With apricots 29°F. is the safe temperature; 26° and 27° F. killed about ⅕ and 22° killed ½. They are, therefore, fairly hardy, but they bloom so early that they are more exposed to the late spring frosts than other fruits.

(6) All the foregoing figures refer to the buds when in full bloom. Starting from this stage, the earlier the stage of development the hardier are the buds, but when the fruit is setting the injury is from 5 to 10% more than when they are in full bloom.

394.—**Studies on Manuring Tobacco.**—I. WIMMER, G., in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Year 36, No. 10, pp. 166-168. Berlin, March 6, 1921. II. VAN DIJK, J., in *Medeelingen van het Deli Proefstation temedan Sumatra*, Series 2, No. 14, pp. 3-38, Year 1910.

I.—*Results of the Experiments Hitherto Made in Manuring Tobacco. The Present State of our Knowledge on the Subject.*—The basal manure used for tobacco crops is a dung poor in chlorides, preferably mixed (horse and cow dung).

Nitrate of sodium is little used, partly on account of the fact that tobacco treated with it often burns badly, probably because of the easily fusible deposit of alkali nitrates on the leaves, and because the leaves dry badly.

Sulphate of ammonium (50 to 100 lb. per acre) or Norwegian calcium nitrate (in double the quantity) are employed; the latter is very suitable, on account of its high lime content. The author found, as a result of many experiments, that ammonium nitrate makes the cigars burn quicker. Good results have been obtained from cyanamide, and much is hoped from synthetic urea. No conclusive proof has been obtained as to the effect of green manures on the burning properties of tobacco.

Potassic fertilizers are very necessary for tobacco. In Alsace, the fields where this crop is to be cultivated are given in the autumn 350 lbs. per acre of potassium silicate ("martelline") in addition to stable manure. Sulphate of potassium is not used, as it is supposed to impart an astringent taste to the tobacco, which, however, has not been observed in Germany.

Experiments were made by Kitzinger for the purpose of determining the effect of manuring upon the quality of cigars, but all smokers are not of the same mind as to the results. Further, the results of tests as to efficacy of potassium carbonate are not in agreement.

A heavy application of stable manure renders the use of a phosphatic fertilizer unnecessary. Where, however, such fertilizers are necessary, it is advisable to choose Peruvian guano and scories, and to avoid fertilizers containing a large amount of sulphates.

As the tobacco plant is calciphilous lime should be added to the soil, if the latter is deficient in calcium.

All these rules as to manuring are of secondary importance in comparison with the method of drying the tobacco during and after growth, especially from the point of view of its burning properties, the chief quality required in smoking tobacco.

II.—*Manuring Experiments Carried out in Tobacco Fields.*—Experiments were made in Sumatra, in 1919, in order to observe the effect of manure upon leaf production and the vigour of the stem. The fertilizers used were superphosphates, ashes, ammonium sulphate and guano.

The best results were obtained, as regards stem growth by a fertilizer containing nitrogen, phosphoric anhydride and potassium in the proportions 1 : 3.6 : 1.

A fertilizer in the proportions 1 : 3.3 : 1, however, generally improved the combustibility of the fermented tobacco.

An excess of superphosphate hinders the growth of the plant.

265.—**Action of Chloropicrin on the Germination Power of Seed.**—MIEGE, E., in the *Comptes rendus de l'Academie des Sciences* Vol. CLXXII, No. 3, pp. 170-173. Paris, Jan. 17, 1921.

Various workers have shown that chloropicrin is a powerful insecticide which is effective for the destruction of certain parasites. The action of chloropicrin on the germination power and the cultural value of seeds, however, remained to be determined.

In a previous experiment on a large scale several quintals of different infested seeds (pea, bean, wheat, etc.) were treated, either by watering the closed sacks, in the way indicated by M. G. Bertrand, or by placing the chloropicrin in vessels placed close to them. With a dose of 20 cc. per cubic metre of space, or per sack of about 80 kg. the pea-weevil (*Bruchus pisi*), bean-veevil (*Br. obtectus*) and the grain-weevil (*Calandra granaria*) were, in both cases, radically destroyed within 24 hours without any apparent harm to the germination power. The wheat alucide (*Sitotroga cerealella*) was also completely destroyed under similar conditions.

In a second series of experiments in the laboratory, samples of seeds of various cultivated plants were placed in dishes under a bell-jar and treated for varying periods with chloropicrin in doses varying from 15 to 50 cc. per cubic metre. Afterwards the seeds were removed and put to germinate under filter paper, in the open air without artificial heat, and compared with untreated controls. The following tables give the results obtained.—

TABLE I.—*Germination power after treatment with 15 cc. of chloropicyin per cubic metre.*

Duration of treatment	Wheat	Rice	Hemp	Flax	Lentils	Fenugreek	Bersim
Control	100	80	69	100	100	100	100
6 hours	93	84	50	100	100	100	100
12 "	82	79	61	100	100	100	100
24 "	70	79	58	100	100	100	100
48 "	66	60	54	100	100	100	100
72 "	69	39	65	100	100	100	100
96 "	71	38	64	100	100	100	100

TABLE II.—*Germination power after treatment with 50 cc. of chloropicrin per cubic metre*

Duration of treatment	Wheat	Beet	Flax	Lentils	Fenugreek	Bersim
Control	100	72	100	100	100	100
6 hours	34	61	95	99	100	100
12 "	36	65	96	100	100	100
24 "	32	58	91	100	100	100

The results show that the destruction of insects parasitic on seeds (wheat and bean weevils, alucides, etc.) is assured by the use of chloropicrin, acting for 24 hours in doses of 15 to 20 cc. per cubic metre. Longer periods of contact and larger doses do not appear to be any more effective.

TABLE III.—*Germination power of wheat treated with 20 cc. of chloropicrin per cubic metre*

Appearance of first sprout	Reference	6 hours	12 hours	24 hours	48 hours	72 hours	96 hours
	3rd day	2nd day	3rd day	3rd day	3rd day	4th day	5th day
No. of germinations after							
4 days	54	65	40	53	25	7	0
6 days	73	77	69	58	49	40	24
8 days	85	84	76	65	58	54	50
10 days	94	88	80	71	62	57	62

The action of the chloropicrin on the seeds varies with their nature, the dose given, and the duration of treatment. Certain seeds of legumes, flax, etc., are not affected by it, but on others, such as hemp, beets, etc., and, in particular, cereals it affects the germination energy and power. This unfavourable influence increases, with the quantity used and the time of contact.

Under the conditions required for disinfection the germination power of wheat is decreased by 30%, a percentage which increases with stronger doses. On the other hand leguminous seeds are absolutely immune.

479.—Inheritance of Resistance to Bunt or Stinking Smut of Wheat, in the United States.—GAINES, E. F., in *Journal of the American Society of Agronomy*, Vol. 12, No. 4, pp. 124-132. Washington, D.C., April 1920.

Details of the experiments are given, and the author concludes as follows:

(1) Bunt resistance in wheat is not a simple Mendelian unit character.

(2) Resistance, if Mendelian, is composed of multiple factors, for a continuous series ranging from complete immunity to complete susceptibility has been obtained.

(3) Different wheat varieties possess different kinds of resistance.

(4) Linkage between resistance and morphological characteristics is not sufficient to prevent the selection of a resistant strain of any morphological type desired.

278.—Results of Crossing the Raspberry Cuthbert With Salmonberry Rubus Spectabilis in Alaska.—GEORGESON, C. C., and BENSON, C. H., in *Report of the Alaska Experiment Station*, 1918, pp. 23-24. Washington, September 1920.

In 1909, crosses were made at the Sitka Experiment Station between the salmonberry (*Rubus spectabilis*) and raspberry var. Cuthbert; the results were, however, unsatisfactory. On many plants blossoms were sterile and failed to set fruit; others were indifferent bearers, and none of them had any qualities that made them superior to good raspberries.

In 1918, however, one hybrid from a cross made in 1916 promised to be of value; the berries were salmon coloured, and of good size and pleasant flavour. This plant was a strong grower and showed some of the characteristics of both parents.

492.—**The Influence of Size and Character of Seed on the Yield of Potatoes.**—SALAMAN, R. N., in *The Journal of the Ministry of Agriculture*, Vol. XXVIII, No. 1, pp. 43-48. London, April, 1921.

In 1920, a preliminary investigation of the above problem was begun. For this purpose a stock of new variety (1) was employed which had been grown in Barley, Herts, the previous year; the tubers had been clamped during the winter and sprouted in the spring.

This main crop variety was well adapted to this type of experiment for two reasons; it is an exceptionally heavy cropper and it is extremely resistant to leaf roll and mosaic disease. The tubers are white kidney and are immune to wart disease.

Selections of the seed tuber were made by the author according to various grades, and the number of tubers in every unit weight of seed was carefully checked. The tubers were selected both for size and weight so that each class was as uniform as possible. The classes selected were (1) 0·4 oz.; (2) 1·3 oz.; (3) 2 oz.; (4) 2·6 oz.; (5) 4 oz.; (6) 5·3 oz.; (7) 5·6 oz.; (8) 6 oz.; (9) mixed seed of all sizes.

The results of the experiments so far as this first year allows of conclusions, are:—

(1) That although small chats give a big return in proportion to their weight as seed, and produce as much, in this experiment even more, big ware than any class of seed, yet it is certainly not economical.

(2) The best seed class are tubers of 2 oz. in weight and these give the best returns, excepting the large tuber sets with secondary growths.

(3) Seed tubers over 2 oz. in weight give smaller crops whilst the amount of seed is progressively greater. The amount of heavy ware is progressively less, both actually and relatively.

(4) The tendency to secondary growth formation is not conveyed to the crop from the seed tuber. It is a peculiarity of big tubers and is not directly influenced by the size of the seed tuber. That the sets with secondary growth should have proved such successful seed is, however, not surprising as they naturally indicate a high vegetative activity on the part of the parent tuber, which experience has long shown to be the best type of tuber seed. Seed tubers with secondary growth make exceedingly good seed, and apart from the fact that they are large and wasteful without cutting, the evidence would tend to show that their use as seed is strongly indicated.

As the value of a potato crop is concentrated in the main on the quantity of the large ware size tubers formed, it is of interest to refer to the table where the percentage of the entire crop represented by the tuber of 4 oz. and over is shown. The highest value, 73% of the total crop is given by seed tubers of less than 1 oz. in weight, *i.e.* by chats, so that it would appear that the larger the set, the smaller the quantity of big ware. When, however, the fact is taken into account of the bigger crop from the 2 oz. sets, the total yield per acre of large ware is considerably greater in this than in any other class. If, however, cut tubers with secondary growth will yield in the same manner as the large ones of class 8, then the advantage of such sets might at least equal that of the 2 oz. set in the production of heavy ware.

The crop of a potato plant must be expressed in the quantity of tuber material produced, and its subdivision into tubers depends on other factors and is probably influenced by environment. The general approximation of the numbers of tubers in the classes of the crop from mixed seed, with that of the average of the 8 seed classes, is a fact of considerable interest.

289.—**Growing of Sunflowers (*Helianthus annus*) in Montana and Use as Silage.**—ATKINSON, A., NELSON, T. B., ARNETT, S. N., JOSEPH, W. E., and TRETSYEN, O., in *University of Montana Agricultural Experiment Station*, Bulletin No. 131, pp. 3-29. Bozeman, Montana, April, 1919.

A brief survey of the characteristics and history of the cultivated sunflower, followed by the results of tests on yields and methods of growing and feeding, as employed at the Montana Experiment Station.

Preliminary tests were carried out from 1915-18 inclusive, to find the crop yield. A comparison of yields shows that while the heaviest yield is from the earliest planting, there are peculiar variations as the date of planting advances. Observations on the growth of the crop led the authors to recommend that planting should be made in the higher altitudes, where the season is short, and as soon as the ground has become warm and is in good condition in the spring. After planting in rows and drills at different distances apart, it was found that the largest returns, 44·1 tons per acre, was obtained from those planted in rows 36 inches apart, and in drills from 30 to 36 inches apart and 4 to 5 inches between seeds. In date-of-seeding tests, the largest yields were produced from the earliest plantings.

(1) This potato is not, as yet, on the market (*Author's note*).

Dry land tests were made in 1918 on 13 different farms in 8 counties, and over 30 acres were planted. The average yield was 10·3 tons per acre. As this was a season of unusually low moisture precipitation, the authors consider it reasonable to conclude that sunflowers are a promising dry land forage crop.

Seed matured only one out of 4 years at the Bozeman Station. From observations, however, it appears that seed should mature regularly in the lower valleys where the temperature is higher and when there is a longer period free from frost.

Practical and experimental results up to date, feeding qualities, yields per acre and frost resisting qualities, all considered, were greatly in favour of sunflowers compared with other silage crops. It was successfully used in winter feeding practically with every class of farm stock, but it was found better to make a combination with dry roughage such as clover, alfalfa, or mixed hay.

Mammoth Russian sunflowers were successfully used for both soiling and silage purposes during the 4 years trial. Silage made from plants 30% in bloom, compared favourably in digestible nutrients with maize silage made from immature maize.

Digestible Nutrients	Total dry substance	Crude protein	Crude fibre and nitrogen free extract	Ether extract	Nutritive ratio
In 100 lbs. of sunflower silage.....	21·4	1·24	10·13	0·37	9·8
In 100 lbs. silage from well matured maize	26·3	1·1	15·00	0·70	15·1
In 100 lbs. silage from immature maize...	21·0	1·0	11·40	0·40	12·3

No difficulty was experienced in getting cattle, sheep, or pigs to eat this silage. Some animals required a few days to become accustomed to it, while others ate readily the first time it was offered. No objectionable flavours or odours could be detected in milk from cows fed this.

Experiments were conducted from 1916-1918 to determine the relative feeding value of sunflower silage, clover hay and alfalfa hay. Results showed that 3·75 lb. of sunflower silage was equal to 1 lb. of choice alsike clover hay, when fed to cows receiving grain and a limited hay ration, and 2·83 lb. was equal to 1 lb. of alfalfa hay.

Chopped green sunflowers 30 to 40% in bloom, were equal to chopped green corn in the roasting ear stage as a soiling crop for dairy cows. Experimental work up to the present, indicated that 30% in bloom has a higher feeding value than silage made from plants less mature. The exact stage of growth that will give the highest quality of silage has not yet been determined; experiments are now in progress.

The silage was found a valuable substitute for part of the hay ration for breeding ewes and brood sows; 2·5 lb. of silage replacing 1 lb. of alfalfa hay in an entirely satisfactory manner.

The most practical method of harvesting sunflowers was found to be with the ordinary corn binder.

290.—Flax Growing Experiments in Ireland, 1915-1919.—*Department of Agriculture and Technical Instruction for Ireland, Journal*, Vol. XX, No. 3, pp. 351-361. Dublin, 1920.

I.—*Manurial Experiments.*—A summary of the results obtained from the 4 series of experiments conducted by the Department during the years 1901-1915 inclusive, led to the following recommendations with regard to the advisable manurial applications to be made to the flax crops per statute acre. (1) On soils in good condition, 1-1½ cwt. muriate of potash or 4-5 cwt. kainit; (2) on poor or medium soils 1-1½ cwt. muriate of potash or 4-5 cwt. kainit and ½ cwt. sulphate of ammonia. In the second case, the mixtures of potassic manures and sulphate of ammonia should be applied a short time prior to sowing the crop.

In 1917, trials were carried out at three centres to compare the results obtained from ground rock (containing about 5% potash), with those from sulphate of potash. The first was applied at rates of 10 cwt., 1 ton and 5 tons per statute acre respectively both singly and in combination with lime. The results of these trials afforded no evidence that dressings of ground rock containing potash would serve as a substitute for dressings in the ordinary soluble potash manures.

In 1919, trials were carried out at 5 centres in which kelp, flue dust, muriate of potash, and sulphate of ammonia + muriate of potash were compared as top dressings for flax. Each of the dressings of potash manures used was equivalent in potash content to a dressing of 1 cwt. per statute acre of muriate of potash containing 50% potash. The variety of seed used was Dutch, showing a germination % of 95. This was sown at the rate of 54 qts. per statute acre. Results showed that the brairds on the unmanured plots were severely affected with yellowing, but no trace of this disease was observed on any other plots dressed either with muriate of potash or

kelp. Where flue dust was used there was a slight touch of yellowing.

After deducting the cost of manures, the various manurial dressings gave the following profits per statute acre:

Muriate of potash + sulphate of ammonia	$60.00
Muriate of potash	43.20
Kelp	40.10
Flue dust	8 65

II.—*Seed Trials* 1915-1919.—In addition to Dutch, Russian and Irish, the varieties of seed of the fibre variety tested included British-East African, Canadian (Ontario), Canadian Western Fibre, Canadian Riga Child (Prov. Saskatchewan), Dutch (White Flowering), English, French, Scottish, and United States seed. The following seed varieties of flax were also tested; Minnesota 25, Canadian Common and Argentine; but none of these gave results that would warrant their being recommended for sowing for fibre purposes. Dutch seed was included in each set of trials each year for comparison purposes.

The variety tests were carried out on different classes of soil, and the results obtained, taken in conjunction with those of previous years, affords conclusive proof that no special variety is specially suitable for a particular class of soil. The relative merits of the various kinds of seed varied from year to year. The largest monetary return was obtained from English seed in four of the five years trials. Of the Dutch varieties, the white flowering variety gave substantially the largest in 2 of the years and slightly lower than the flowering variety in the third year. The white variety produced taller and slightly more branched flax, and was about 10 days later in ripening than blue. Neither the French nor the U.S.A seed gave as good results as the Dutch.

Pure line seed trials were carried out in 1919. The Department's pure lines Nos. 3 and 5 showed a striking uniformity of flax straw compared with that grown from any of the commercial varieties, and from these results it is clearly evident that the flax crop can be greatly improved through the propagation of pure line seed from single selected plants.

LIVE STOCK

319.—The Efficiency of Purdue Calf Meal as a Milk Substitute in Calf Feeding.— SPITZER, G., and CARR, R. H., in *Bulletin* No. 246, pp. 1-8, Lafayette, Indiana, 1920, and reviewed in *Experiment Station Record*, Vol. 43, No. 91, pp. 875-876. Washington, 1921.

Purdue calf meal consists of maize meal, linseed meal and liquid beef blood (8 : 1 : 12) plus steam ground bone to the extent of 1%. This is dried for from 4 to 6 hours at a temperature not over 140° F., and then ground.

An hour or so before feeding it is mixed with 4 times its weight of warm water, forming a jelly. This is again diluted at feeding time and is fed at blood heat. Liquid blood meal thus prepared, was more readily digested than commercial dried blood.

A group of 36 grade Holstein calves varying in age from 10 to 20 days, and in weight from 85 to 126 lb. were fed for 140 days. A lot of 12, receiving whole milk throughout, showed an average gain of 1·91 lb. per head. A similar lot fed on skim-milk, after the first 10 days showed an average daily gain of 1·73 lb. and a third lot fed on Purdue calf meal gained 1·18 lbs.

Ground maize and oats (1 : 1) was fed as a dry mash to each lot, and for part of the time the calves had access to bluegrass pasture (*Poa pratensis*) or clover hay.

The calf meal lot were thrifty and remained in good condition, and during 6 months of pasture following the feeding period, they gained about the same amount as the other lots.

413.—The Value of the Purebred Sire in Increasing the Production of a Scrub Herd.— MCCANDLISH, A. C., in *Journal of Dairy Science*, Vol. IV, No. 1, pp. 12-23. Baltimore, Jan., 1921.

Report of experimental tests made at the Iowa Station mating scrub cows purchased in Arkansas to purebred dairy bulls of the Holstein, Guernsey and Jersey breeds, with a view to testing their value as regards increasing producing ability of the herd (milk and butterfat).

A number of grade animals sired by purebred bulls (Holstein, Guernsey or Jersey) and descended from scrub cows was studied in two groups: the first generation grades, *i.e.* those carrying 50% of blood of one of the recognized dairy breeds, and the second generation grades *i.e.* carrying 75%.

First Generation Grades.—Purebred Holstein bull X scrub cow, showed in the first generation an increase over their dams in milk and butterfat production, with an average of 89% in milk and 58% in fat. In the case of F_1 of Guernsey grade X scrub cow, the average increase in yield was 17% in milk and 27% in butterfat, and with Jersey grade X scrub cow, it was 22% in milk and 34% in fats.

Second Generation Grades.—The average increase in production for the second generation Holstein grades as compared with their scrub grand dams was 174% in milk and 130% in fat. In the case of Guernsey grades, 72% in milk and 94% in fat; and for Jersey second grades, 59% in milk and 74% in fats.

In an appended table, the averages for two generations of grades and their scrub ancestors are given.

The results obtained show clearly that the use of purebred sires is a sure way of increasing milk and butterfat production, if bred with a scrub herd, on condition, that the bulls are selected carefully both from the point of view of their heredity and also of their individual capacity.

414.—Rearing Calves on Milk Substitutes.—DECHAMBRE, in the *Comptes rendus des séances de l'Academie d'Agriculture de France*, Vol. VII, No. 6, pp. 107-122. Paris, February 9, 1921.

The Animal Husbandry Section (*Section d'Economie des Animaux*) of the Academy of Agriculture of France requested the author to read a paper on the means of ensuring the proper feeding of young hand-reared calves without interfering with the milk supply required for human consumption or by the dairy industry. In this communication, the author describes the methods to be recommended, and which are at present in use.

Instead of feeding calves exclusively on milk, great economy can be effected by the use of various substitutes.

Of these the chief is skim-milk, whether fed alone, or with the addition of suitable substances; its use promotes the consumption of farinaceous matters, grain, or similar foods. *Whey* from the cheese-factories, *hay tea* and an *infusion of barley radicles* can also be fed, provided such nutritive and digestible substances are added as give the mixture the nutritive value of whole milk. These liquids also serve to complete a ration containing farinaceous substances, grain, or seeds. Calves are still reared on *mashes* consisting of various ingredients, and finally, on suitable dry foods that are properly prepared and fed. Among the substitutes usually least known to practical agriculturists are *starch, manioca flour, rice flour, linseed, meat meal.*

Details of the composition of the rations are given, and the article concludes as follows:

Many preparations can be used as substitutes for milk in feeding hand-reared calves. Whenever skim milk can be obtained, it forms a basis which can easily be completed. Should it be unprocurable, hay tea can be used instead, or else one of the above-given recipes, the choice being determined by economy and the ease with which the ingredients can be obtained. The next point is to remember that absolute cleanliness is indispensable, not only in preparing and distributing the rations, but also in the utensils, mangers, stalls, and litter. Illness in hand-reared calves is frequently due, either directly or indirectly, to the lack of hygienic precautions.

In the discussion that followed the reading of this paper, H. Sagnier mentioned that he had seen margarine used in Italy on a large scale for feeding calves as a substitute for the fat contained in skim-milk.

Dechambre stated that much skim-milk was used in Italy; margarine and groundnut oil can be added to it, but a special apparatus is needed for making the emulsion.

Calves are reared on hay-tea in Normandy. It can be given alone, but it is better to add flour, ground oats, or linseed meal (30 gm. per litre), or else crushed oats or linseed, which should be fed in a special manger.

415.—Maize Stover Silage Versus Maize Silage for Milk Production.—MORRISON, E. B., HUMPHREY, G. C., and HULCE, R. S., in *Journal of Dairy Science* Vol. IV, No. 1, pp. 29-31. Baltimore, Jan., 1921.

Experiments made at Wisconsin Experimental Station, Madison, with 8 cows, producing an average of 1¼ lb. fat daily. They were separated into 2 equal groups, each being fed with two kinds of silage on the double reversal method for 2 periods each of 4 weeks duration with a preliminary week preceding each. The concentrate mixture used consisted of: 4 pts. ground maize + 4 pts. wheat bran + 1 pt. linseed meal + 1 pt. cottonseed meal and alfalfa hay fed at the rate of slightly less than 1 lb. of hay daily to each 100 lb. of cow weight. Each kind of silage was fed *ad libitum* twice daily. Apparently the cows consumed on an average about 5 lbs. less stover silage daily per animal than of maize silage (33·25 lb. to 28·31 lb.).

Results indicated that the average daily milk production on the maize silage ration was about 3 lb. more daily per cow than on stover silage (27·4 to 24·5 lb.). A corresponding relationship existed also in the productions of butterfat (1·05 to 0·98 lb.).

Both lots lost to a certain extent in live weight, but the difference is not great enough to be considered significant.

A comparison between the two silage rations from the financial standpoint, shows that the price at which stover silage could be figured was 61% of the price at which maize silage was valued.

325.—Poultry Keeping in Fruit Plantations.—GARRAD, G. H., in the *Journal of the Ministry of Agriculture*, Vol. XXVII, No. 4, pp. 350-359. London, July, 1920.

The author's object is to show that poultry keeping and fruit growing can be made a very profitable combination. A detailed report is made of the work carried out on 14½ acres of land in the southeast of England on a steep hill facing south. The author himself checked the accounts of the said fruit farm.

The results supported the opinion expressed by Theobald, the Agricultural Entomologist, that the employment of poultry as a means of checking some of the insect pests of fruit is a subject that deserves far more attention than it has hitherto received. As an example of what fowls eat in an orchard, he gives an analysis of the crop and gizzard contents of a White Leghorn chicken of 5 weeks old, namely: 190 pear midge maggots, 127 aphides, 12 red ants, 2 tortrix caterpillars, and 1 beetle in addition to grain seed and other foods. A Red Sussex pullet contained 14 leather jackets, 10 fever flies, 2 wireworms, 4 cutworms, 5 beetles, 50 ants, 7 woodlice, 4 slugs, 1 millipede and 20 larvæ of the winter moth. The light breeds, such as Leghorns, hunt the best and go further afield than the heavy breeds such as Wyandottes and Orpingtons, and in orchards of standard trees they are therefore the most suitable breeds to use for this purpose.

With reference now to the fruit farm in question, the owner does not believe in deep digging because it prevents the fine feeding roots of the trees from working their way close up to the surface of the ground where they can make full use of the poultry manure. Also a shallow tilth is preferred to prevent the winter caterpillars that fall from the trees burying themselves deeply in the soil. The practice of walking through a plantation and shaking each bush is recommended, as the poultry follow and consume each caterpillar as it falls to the ground. Only young chickens are allowed to run among the gooseberry bushes, the hens being confined in coops but hens properly fed will not attack the fruit (nor even currants until they begin to colour), and do a great amount of good by picking off the scale insects. They are also invaluable in dealing with raspberry and loganberry beetle, but do not attack the hairy sawfly caterpillars on gooseberries, and only cuckoos will deal with these. Windfall apples will, of course, be attacked by the birds but this is unavoidable.

No expensive poultry houses or appliances are kept and nearly all are home made. A 100-egg incubator has been used on a few occasions in the past 2 seasons, but with that exception all the eggs have been hatched out under hens. The breeds kept are the White Wyandottes, Buff Orpingtons and White Leghorns; all general utility fowls.

From the balance sheet it is evident that the poultry proved exceedingly profitable.

FARM ENGINEERING

331.—Utilization of Automobile Engines.—RINGELMANN. M., in the *Journal d'Agriculture pratique*, Year LXXXV, Vol. 1, pp. 12-16. Paris, Jan. 6, 1921.

The utilization of old touring-car engines may be of interest to country agricultural work-shops, repair-shops, and for grinding and crushing grain, in cider factories, for pumping water, etc.

It is preferable to remove the engine from the chassis and bed it on a suitable frame resembling that used as a bed for testing engines in a motor works. The frame may be made of double *T* irons, or of hard wood, and the engine bed bolted on to it. For certain kinds of work it is best to gear the engine down. This can be done by keying a pinion on to the main shaft geared to a counter shaft such as is used in electric dynamo plants. It is better to have spur gearing which is silent or a green leather pinion. The countershaft, running at, say, 250-300 revolutions per minute, carries a belt pulley.

The fan-cooled radiator should be replaced by a tank placed laterally and high up. But if the water is circulated by a pump, this system should be retained as the hot water discharge pipe is not wide enough to allow a rapid enough flow of cool water if the thermo-siphon is to be used.

The exhaust expansion box should be done away with as it always causes a certain amount of back pressure, and a wide pipe should be substituted, that is sufficiently long to prevent flames issuing that might cause fire. By doing this the author increased the power of an old engine by 10% at the Station d'Essais de Machines, without increasing the fuel consumption. The engine may be set on top of a brick platform about 45 cm. high, so that it is easy to turn the starting handle, or it can be mounted on a platform provided with 4 cast iron rollers, or on a trolley. Light, high speed engines, weighing not more than 20 kg. per H.P. can only be kept steady by weighting the frame with stones, wooden boxes filled with earth, etc.

When the capacity of the engine is known, it is advisable to set up a power plant on one frame, *i.e.* pump, saw, generator, etc. It is better to use a carburettor which can use paraffin instead of petrol, or better still, a poor gas generator, to reduce the cost of fuel, especially under present conditions.

AGRICULTURAL INDUSTRIES

431.—Changes Taking Place in the Tempering of Wheat.—TAGUE. E. L., in *Journal of Agricultural Research*, Vol. XX, No. 4, pp. 271-275. Washington, D.C., Nov. 15, 1920.

In milling wheat it has been found advisable to temper or condition the grain before grinding. This process consists in adding a certain amount of water to the wheat, then thoroughly mixing and allowing it to stand for a time. The treatment toughens the bran coat of the kernel, thus making possible a separation of the bran and the flour and increases the desirable milling qualities of

the wheat in other ways. The yield of flour is increased and a flour is obtained which permits a better quality bread being made.

Three varieties of wheat were used for the experimental work: (1) Kanred.—hard var. with 12·65% moisture content: (2) Turkey or Kharkof.—hard red var. with 10·86 ditto. (3) Arizona white wheat,—soft var. with 10·8% ditto. The only chemical changes considered in this study were changes in hydrogen-ion concentration, total acidity, water soluble phosphorous and titrable nitrogen.

Different periods of time, temperatures and moisture contents were compared as follows:—(1) Time, 24, 48 and 72 hours; (2) temperature, 5°, 20° and 40° C.; and (3) moisture content, 15½ and 18%.

When the wheat was tempered at 5° C. there was practically no change as compared with the untempered wheat, but as a general rule the yields were slightly higher and the milling qualities were considerably better than those secured from the latter. The length of time appeared to have very little influence on either the physical or chemical composition of the flour.

At 20° C, the hydrogen-ion concentration was increased, the total acidity, water soluble phosphorous, and titrable nitrogen were also higher, and there was a distinct advantage over the results at 5° C. The chemical changes were still more pronounced when the grain was tempered at 40° C. and the physical changes appeared to be detrimental after 48 hours so far as the milling value of the wheat was concerned. In general the milling qualities of the drier wheats were improved by tempering more than those of the wetter wheats, and the hard wheats more than the soft, and a 15½% moisture appears to be about the best.

441.—**Preservation of Canvas Sacks Intended for the Reception of Products Used in Agriculture.**—LAVERGNE, G., in the *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VIII, No. 1, pp. 29-30. Paris, January 5, 1921.

The author, having had occasion to saturate with carbon dioxide large quantities of natural alkali carbonates extracted from Vichy water, spread them, in order to carry out the process, upon screens covered with more or less fine canvas, and found the fabrics were rapidly destroyed by the corrosive action of the damp carbonates, so that it was necessary constantly to renew the canvas. The idea then struck him to silicate the material; this increased the duration of the canvas tenfold, and effected a considerable reduction in expense.

He therefore suggests that the process might be applied for the purpose of preserving the large coarse canvas sacks used for keeping various substances required in agriculture (fertilizers, chemical products, etc.) and which wear out very soon.

The experiment is most easily carried out by diluting one litre of silicate of potash or soda with twenty litres of water, immersing the sack in this mixture until it is well impregnated, then wring it out well in order to recover some of the liquid, which can be used again.

559.—**Method for the Detection of Abnormal Milks.**—BAKER, J. C., and VAN SLYKE, L. L., in *Technical Bulletin* No. 71. *New York Agricultural Experiment Station*, pp. 1-14. Geneva, N.Y., June, 1919.

The method employed was based upon the use of brom-cresol purple as an indicator.

Clark and Lubs were the first to suggest the use of this indicator in connection with milk cultures. They made use of the dye then known as dibrom-ortho-cresol-sulfon phthalein (*Journal of Agricultural Research*, Vol. 10, p. 105, 1917). This dye can be purchased from Hynson, Westcott and Dunning, Baltimore, Md.

One drop of a saturated water solution of this dye is mixed with 3 cc. of milk, and the colour is observed. Normal fresh milk gives a greyish-blue shade. The production of a darker or lighter colour awakens suspicion in regard to the normal character of the milk. The colour is made lighter by acids, acid salts, formaldehyde, and also by heating above the usual point of pasteurization. The colour becomes deeper blue in the case of milk from diseased udders, watered milk, skimmed milk, and milk containing alkali or alkaline salts. In the inspection of milk, a sample is taken for further detailed examination in the laboratory. If the colour is sufficiently lighter or darker than normal it indicates the probability of some abnormal condition.

The method has been applied and 570 samples of market milk examined. Watered milk is thus easily detected, and also milk containing excessive numbers of leucocytes. A standard of colour can be prepared by which comparison can be made and conclusion more easily reached as to the normality or abnormality of samples examined.

PLANT DISEASES

335.—**The Phytopathological Services of Uruguay and the International Phytopathological Convention at Rome.**—Communicated by Dr. E. J. Rovira, Delegate of Uruguay.

I have the honour of communicating to my esteemed Colleagues of the Permanent Committee, the information that, by the instrumentality of the Ministry of Foreign Affairs, I have received from the Ministry of Commerce of my country. This communication not only shows the interest taken in the Phytopathological Service by the

Government Authorities of Uruguay, but also manifests their entire approval of the work accomplished, and the conclusions reached, by the International Phytopathological Conference held in Rome.

The present constitution of the organization of the Uruguayan Phytopathological Services completely complies with the formalities declared obligatory by the Convention of Rome in the case of all the adhering States. Through the initiative of Uruguay, an International Phytopathological Conference, similar to that held at Rome, met in Montevideo in May, 1913. It approved three Conventions which, taken together, indicate and establish the same measures as those enforced by the Convention of Rome, and lay similar obligations upon the adherent States.

For this reason, the Ministry of Commerce is of opinion, that there is nothing to hinder Uruguay from notifying her adherence to the Rome Convention.

In accordance with Art. 9, of the International Convention of the "Defense Agricola" signed at Montevideo, an International Bureau, with headquarters at that town, has been established under the direction of an agricultural expert appointed by the Government of Uruguay. We may therefore conclude that this Bureau will be of great use in establishing international relations with a view to diffusing information respecting the movements of agricultural pests, and the means of their control.

The fact of its existence shows that since the headquarters of this movement is established in South America, Uruguay should recognize its own obligations and those of the other States united together by the bond of a common aim.

In agreement with this view, and in consequence of the conclusions arrived at by the International Phytopathological Conference of Rome, the Ministry of Commerce passed the following resolution on September 3, 1914:—

(1) All plants, or parts of plants, intended for cultivation, as well as flower bulbs and cut flowers sent abroad, shall not leave the country unless they are provided with a certificate stating them to be free from the plant parasites enumerated in the official list of the importing State.

(2) The General Direction of the "Defensa Agricola" is required to take all the necessary measures for supplying these certificates and obtaining the exporters' declarations in accordance with the stipulations of the International Phytopathological Conference at Rome.

(3) The products mentioned in Art. 1 shall only be exported from ports authorized by the general regulations dealing with the protection of agriculture.

I much regret that this information did not arrive in time to be incorporated in the interesting report on this subject presented to the last General Assembly by the Hon. Delegate of Sweden, but I hope that it will nevertheless be received with satisfaction by the Permanent Committee.

As regards the definitive adherence of Uruguay to the Convention of Rome, I am awaiting the instruction of my Government.

345.—**Phomopsis Pseudotsugae Deuteromycete Injurious to Pseudotsugae Douglasii in England.**—ALCOCK, N. L., in *The Gardener's Chronicle*, Vol. LXIX, No. 1778, p. 45, Jan. 22, 1921.

During the summer and autumn of 1920, plantations of Douglas Fir (*Pseudotsuga Douglasii*) were attacked by *Phomopsis Pseudotsugae* in several English localities; the characteristics associated with the attack were similar to those previously observed in Scotland.

The disease is causing serious loss among the English plantations. In one case in Hampshire in 1919, over 20% of the young leaders are reported to have been killed, which will seriously affect the future shapeliness and value of the trees. In an adjoining plantation with trees of about 8 years old, considerable numbers of stems and branches are affected.

At Bagshot (Surrey) in the nursery at Ripley, the disease has attacked and injured a considerable number of transplants, *i.e.*, 4 year old plants. At Swinley (Berkshire) and in other nurseries, the disease has attacked the leader or the young branches of a considerable number of plants. It has been found at Midhurst (Sussex), and is probably widespread, and is evidently a serious pest as regards young plantations of *P. Douglasii*.

453.—**Wart Disease of Potato** (*Synchytrium endobioticum*) **also Attacks Tomato Plants, in Pennsylvania.**—*Weekly News Letter*, Vol. VIII, No. 30, p.3. Washington, Feb. 23, 1921.

Recent investigations made by the United States Department of Agriculture on the control of the potato wart disease (*Synchytrium endobioticum* (Schilb) Perc, = *Chrysophlyctis endobiotica* (Schilb.), a European trouble found in North America in 1918, disclosed the fact that this disease also attacks tomatoes. Out of 28 varieties of tomatoes planted in the wart-infested gardens of the eastern Pennsylvania, 26 were found to be susceptible to the disease.

It is at present known to be confined to gardens in a few mining villages in Pennsylvania, West Virginia and Maryland. The disease attacks only the stems and roots of the plant, causing the formation of small warts; it probably does not reduce the yield of fruit.

The importance of the discovery of the susceptibility of tomatoes to potato wart lies in the fact that affected tomato plants will serve to carry the disease over from year to year in the absence of potatoes, and to introduce it into new localities through the transplanting of tomato seedlings grown in infested soil. It is not yet definitely known whether all varieties of tomato are susceptible to wart disease, but it is feared that such may be the case. Other plants belonging to the Solanaceae are suspected of being susceptible to wart and some have already been tested, but with inconclusive results; the tests will, for this reason, be repeated.

454.—**Onion Smut** (*Urocystis Cepulae*) **in England.**—*Ministry of Agriculture and Fisheries*, Leaflet No. 365, pp. 1-6. London, February, 1921.

The attacks in England of Onion Smut (*Urocystis Cepulae*) are confined at present to five centres. They occur in strictly localized areas in the following localities: near Northampton, St. Neots and Kendal, and in market gardens in two districts in Northumberland.

A description of the disease, method of infection and means of control are here given.

Leeks are, if anything, even more susceptible to smut than onions, so that the cultivation of this crop, and also of shallots, should be confined to soil free from contamination.

The application of a solution of formaldehyde to the drills at the time of sowing, has, however, proved very effective. The Ministry of Agriculture in London is carrying out trials with this substance in the hope of being able to recommend a simple and satisfactory method of treatment.

Onion smut was scheduled in 1920 under the Destructive Insect and Pests Act. Under the Order no person is allowed to sow onion seed in the locality declared by the Ministry to be an "infected place." Onion plants grown in an infected place may not be removed until the plants have been inspected whilst growing, by an Inspector of the Ministry and certified by him to be free from smut, and have been washed free from soil. Any person in charge of land on which onion smut exists must notify the fact to the Ministry or to an Inspector of the Ministry. If smut is found to exist in any subsequent year, a further notification of disease must be given. Any person failing to comply with the requirements of this order is liable to a penalty not exceeding ten pounds (sterling).

INJURIOUS INSECTS

462.—**Experiments on the Toxic Action of Certain Gases on Insects, Seeds and Fungi.**—NIEFFERT, I. E., and GARRISON, G. L., in *United States Department of Agriculture*, Bulletin No. 893, pp. 1-16. Washington, D.C., 1920.

Report of experiments made to test the action of certain toxic gases and to determine the value of these gases for fumigating purposes. The Bureau of Entomology of the United States in co-operation with the Chemical Warfare Service of the United States War Department made experiments on the action of toxic gases upon the body louse (*Pediculus corporis*) DeG. Nearly 800 fumigations, in which 20,000 insects of about 15 different species were treated, took place. The results obtained as shown in appended tables, lead to the following conclusions:—

Phosgene ($COCl_2$) is not useful as an insecticide because of the toxicity towards human beings, its high vapour pressure, the difficulty of controlling it, and its comparatively low toxicity towards insects; neither does it possess any value as a fungicide.

Arsine ($As\ H_3$) has no advantage other than the ease of generation and possesses many disadvantages as an insecticide. Its toxicity towards insects is comparatively low, it is injurious to plants, and has no effect on fungi.

Illuminating gas in concentrations up to 3%, and for exposures up to 2 hours is not toxic to insects. Carbon monoxide in concentration up to 3%, and for exposures of 2 hours is also not toxic.

Of the gases tested, cyanogen chloride and chloropicrin give promise of being useful for fumigation purposes. Neither of these, however, can be used in greenhouse fumigation, because of their injurious action on plants. Nevertheless they probably can be used in the fumigation of stored products.

The efficiency of chloropicrin as an insecticide is undoubted, and in general it is more poisonous to stored product insects than hydrocyanic acid. Other advantages which it possesses are ease of detection, and non-inflammability; its disadvantages are its adherent quality, which makes it necessary to air the material for some time after it has been fumigated, its corrosive action on metals, its severe lachrymal effect, and its low volatility. This last objection may be partially overcome by pouring the dose required on paper, thereby increasing the evaporating surface.

As an insecticide, the effect of cyanogen chloride is practically the same as that of hydrocyanic acid. Its disadvantages are its injurious effect on plant life, low boiling

point, slightly corrosive action on metal and severe lachrymal effect; its advantages are that it is active as a fumigant, is easily detected, is not injurious to seeds in doses which are toxic to insects and fungi, and is no more toxic towards human beings than hydrocyanic acid. It is safer to use than the latter because it can be detected in ower concentrations.

More experiments on the fungicidal aspect are necessary to work out in greater detail the methods of its use. Since it is a dry gas and does not injure the seeds, its use would offer a decided advantage over the present method of treatment for fungi, whereby the seeds are moistened, which sometimes causes germination before it is desired.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

247.—**Evidence of Climatic Effects in the Annual Rings of Trees.**—DOUGLASS, A.E., in *Ecology*, Vol. 1, No. 1, pp. 24-32, Brooklyn, N.Y., Jan., 1920.

277.—**Crosses Between Cultivated Strawberry Varieties and Wild Varieties in Alaska to Obtain Hardy Commercial Berries.**—GEORGESON, C. C., and BENSON, C. H., in *Report of the Alaska Agricultural Experiment Stations*, 1918, pp. 22-23. Washington, August, 1920.

255.—**Electroculture.**—1. MACCRECY, R.D.; The Theory of Electroculture, *Scientific American*, Vol. CXX, No. 20, p. 530, New York, 1919.—II. Electroculture at Chester. *The Electrical Times*, Vol. LV, p. 205, London, 1919.—III. BLACKBURN, A. E., Electrochemical Treatment of Seed Grain, *The Electrical Review*, Vol. LXXXV, pp. 377-379.

258.—**A Survey of the Fertilizer Industry.**—GOLDENWEISER, E. A., in *United States Department of Agriculture, Bulletin* No. 798, pp. 1-29. Bibliography of Government Publications. Washington, D.C., October 20, 1919.

266.—**The Assimilation of Carbon Dioxide by Green Plants.**—MAZE, P., in I. *Comptes rendus de l'Academie des Sciences*, Vol. CLXXI, No. 26, pp. 1391-1393. Paris, Dec. 27, 1920.—II. *Ibid*, Vol. CLXXII, No. 3, pp. 173-175. Jan. 17, 1921.

279.—**Red Clover Seed Situation in the United States.**—*The Market Reporter*, Vol. 1, No. 7, pp. 97, 102-104, 107. Washington, D.C., Feb. 14, 1920.

283.—**The "Cignarellone" Wheat of Molise, Italy.**—IOSA, G., in *L'Italia agricola* Year LVIII, No. 1, pp. 1-7. Piacenza, January 15, 1921.

322.—**Influence of the Time of Calving Upon the Annual Milk Production of Cows.**—SCHMIEDER, in the *Deutsche Landwirtschaftliche Tierzucht*, Year XXV, No. 5, p. 46. Hanover, January, 1921.

328.—**Results Given by Tractors in Belgium.**—LEPLAE, E., in the *Journal de la Societe nationale des Agriculteurs de Belgique*, Year III, No. 7, pp. 49-53. Brussels, Feb. 12, 1921.

333.—**Cost of Threshing in France.**—RINGELMANN, M., in *Journal d'Agriculture Pratique*, Year LXXXIV, Vol. II, No. 46, pp. 389-391. Paris, Nov. 11, 1920.

338.—**Resistance of Different Varieties of Cabbage to Fusarium Conglutinans Wollenw. in the United States.**—JONES, L. R., WALKER, J. C., and TISDALE, W. B., in *Agricultural Experiment Station of the University of Wisconsin Research Bulletin*, No. 48, pp. 3-34. Madison, November, 1920.

340.—**The Part Played by Copper in Anticryptogamic Mixtures.**—VILLEDIEU, VIVALA SAGNIER, H. and GERVAIS, P., in the *Comptes rendus des Seances de l'Academie d'Agriculture de France*, Vol. VI, No. 31 (Oct. 27, 1920), pp. 762-768 and 754-756. Paris, 1920.

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THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief indication of the contents of the more important articles in the November and December numbers of the Institute Economic Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, as long as the supply for distribution is not exhausted.

November

The Development of Co-operation in Japan. 12 pages. The final installment of a comprehensive article on the subject. It deals with co-operative credit societies, co-operative societies for the sale of produce, co-operative purchase societies, co-operative productive societies, agricultural storage, federations, and the central union of co-operative societies. The author concludes as follows:

"The Co-operative societies of Japan are organized in conformity with special provisions of the law, intended to bring into prominence the special characteristics which co-operative societies ought to have. These are:

1. Limitation of the amount which each member may invest in the co-operative society.
2. Perfect equality among the members irrespective of the number of shares held by them.
3. Limitation of dividends.

These conditions are made compulsory to prevent the society from assuming a speculative character, and to bring into greater prominence the principle of mutuality.

The result of these precautions has hitherto been satisfactory, because at present it seems that no society has assumed a capitalist character, but all are making healthy and natural progress.

Furthermore, considering that only a short time has passed since the law on co-operation came into force, and also that Japanese society in general is not quite prepared to receive new ideas with favour, the present results are very encouraging.

The importance of the work done seems, however, to offer a guarantee that the continual and tenacious efforts of the Japanese Government will successfully conduct the system of co-operation to its full realization.

The foregoing study, based as it is on statistics and precise information, shows, moreover, the increasing diffusion of co-operative societies throughout the Empire, and the importance of their influence on the markets and on the economic life of the country; it also indicates the fact that the enormous development of all the economic, industrial and commercial activities of Japan, promoted by the world war, is reflected to a considerable extent in the co-operative movement, showing its full maturity and the possibility of an eventual extensive development, such as the altered condition of the prosperity of the country requires.

The great want of Japanese co-operation is a special institution of credit such as exists in other countries. This want is so strongly felt by Japanese co-operators that an active effort is being made for the creation of a central credit institution for co-operation. Many demands and proposals have been put forward by various co-operative congresses, and it seems that the Japanese government is taking the question into serious consideration."

The Steps Taken During the War to Replace Mobilized Farmers and Farm Workers.— 9 pages. The second and concluding installment of an article begun in the October number. This installment deals with the institutions engaged in recruiting and distributing agricultural labour, including the National Agricultural Labour Office, and the Departmental Agricultural Labour Committees.

The Repatriation of Australian Soldiers.— 7 pages. Gives the early history of the repatriation movement in Australia, describes the Department of Repatriation, and gives the definitions of "discharged and returned soldiers" in the different States of the Commonwealth. The article is continued in the December number.

Measures Adopted for the Encouragement of Agriculture in Austria During the War.— 17 pages. The first installment of an article by Dr. Hermann Kalbrunner. Deals with the condition of agriculture before the war, and the measures adopted during the war, including the measures for intensifying production, for protection against plant diseases and vermin, for maintaining the supply of fertilizers, measures relating to labour, to draught animals, to the production and distribution of agricultural machines, and measures for encouraging market gardening and fruit growing.

Other articles in the November number are: The Co-operative Sale of Grain in Bulgaria; The National Confederation of Agricultural Associations in France; The Bill for Insurance Against Accidents in Agricultural Labour in Holland; Mutual Live Stock Insurance in Italy; The Agricultural Credit Provided by the Bank of Naples and the Bank of Sicily.

December

The Measures Adopted in France since 1914 to Encourage Agricultural Co-operation.—12 pages. Describes the support which public authorities have given since 1914 to the mutual agricultural credit banks. Deals first with the normal activity of these banks, bearing upon transactions effected in virtue of laws previous to the war, then describes how under pressure of circumstances they have been obliged to extend their spheres of action. An account is given of the Law of August 5, 1920, which unified and adapted to new requirements the previous laws on agricultural credit. The question of subsidies to associations for the encouragement of motor cultivation is also dealt with.

The Teaching of Co-operation and of Mutual Insurance in Italy.—7 pages. For some time past the teaching of co-operation and of agricultural mutual insurance has been more and more organized in Italy, by certain bodies which have recognized the desirability of forming, by means of courses of technical and practical instruction, individuals capable of carrying on propaganda and of directing the co-operative movement, which is becoming of great importance to the country. The work done in different educational institutions for instructing teachers in co-operation is described in the article. An account is given of the proposed plan to appoint itinerant instructors in co-operation. The work of these instructors would be: (a) to carry on an active propaganda for the promotion of provident institutions in their various forms (mutual insurance, co-operation, saving, insurance); (b) to explain the rules for the formation and successful working of such institutions; (c) to facilitate them in starting work and in their practical working, providing also for necessary supervision; (d) to calculate in advance the charges falling upon the societies and the corresponding receipts; (e) to popularize the hygiene of labour, and social legislation in general.

The means of giving effect to this programme were: oral propaganda, publications judiciously distributed, special lessons to candidates for the post of masters in elementary schools, and of communal secretaries, prize competitions, and other forms of encouragement for the best institutions.

The Repatriation of Australian Soldiers.—10 pages. The second and last installment of this article. Deals in detail with soldier settlement in each of the States of the Commonwealth.

The Measures Adopted for the Encouragement of Agriculture in Austria During the the War.—11 pages. This concluding instalment deals with the measures relating to vine growing, cultivating of sugar beets, potatoes, seeds, etc., the supply of cereals and meats, feeding stuffs, stockbreeding, the milk industry, finance, etc.

Other articles in the December number are: The Co-operative Movement in Finland in 1919; The German Co-operative Congress; The Italian National Credit Institute for Co-operation and its Work in 1920; Co-operative Dairies in Sweden in 1919; Agricultural Mutual Insurance Societies in France in 1920; The Bankers' Live Stock Loan Corporation in the United States; New Types of Agricultural Loan Made by the Mortgage Bank of Uruguay for the Encouragement of Colonization; Agrarian Reform in Czecho-Slovakia.

AGRICULTURAL STATISTICS

AREAS SOWN TO WINTER CEREALS

Countries	Wheat			Rye		
	1921–22	1920–21	Average 1915–16 to 1919–20	1921–22	1920–21	Average 1915–16 to 1919–20
	Acres	Acres	Acres	Acres	Acres	Acres
Belgium	337,000	306,000	271,000	543,000	559,000	441,000
Bulgaria	1,819,000	2,127,000	2,018,000	401,000	433,000	383,000
Spain	9,922,000	10,230,000	10,270,000	1,737,000	1,810,000	1,815,000
Finland	20,000	20,000	19,000	613,000	606,000	591,000
France (including Alsace-Lorraine)	11,860,000	12,670,000	11,074,000	2,056,000	2,161,000	2,021,000
Poland	2,434,000	2,000,000	.....	10,940,000	8,837,000	.....
Roumania	3,950,000	4,750,000	.....	404,000	656,000	.....
Czecho-Slovakia	1,407,000	1,410,000	1,410,000	2,114,000	2,131,000	2,184,000
Canada	842,000	792,000	857,000	.....	.....	.....
United States	44,293,000	44,847,000	41,747,000	5,184,000	4,228,000	5,322,000
India	28,012,000	25,722,000	30,499,000	.....	.....	.....
Algeria	1,383,000	1,383,000	.....	.....	.....	.....
Tunis	1,285,000	1,500,000	1,457,000	.....	.....	.....
Countries Totals	107,564,000	107,757,000		23,992,000	21,421,000	

FOREIGN CROP PROSPECTS

(Based on information received up to April 24th)

United Kingdom.—Wheat has wintered well in the United Kingdom and the condition of winter wheat is up to the average. Cold, unsettled weather was experienced during the last part of March, and spring sowing was considerably delayed.

France.—Stormy weather delayed spring field work, and was unfavourable for growth. The French official report for March indicated that the condition of the wheat crop was slightly inferior to that of the same period last year. The winter wheat area is 11,860,000 acres against 12,670,000 last year.

Belgium.—The winter crops are reported to be in good condition, although some re-sowing will be necessary.

Italy.—Conditions are favourable for the winter wheat crop. Spring sowing is proceeding actively.

Sweden.—The wheat fields have been generally well protected by snow during the winter.

Spain.—Crop conditions were satisfactory early in April.

Germany.—Cold, frosty weather prevailed during the latter part of March, and considerable damage was done to the crops.

Roumania.—The latest official crop report gives the winter wheat area as 3,950,000 acres, compared with 4,750,000 last year. Spring weather was very favourable and the soil in good condition. Efforts were being made to increase the spring wheat acreage.

Jugo-Slavia.—Winter wheat has a good appearance and is very forward in growth. Spring ploughing was well advanced.

North Africa.—Growing conditions are reported to be favourable in Tunis and Algeria and a fair crop is expected. Drought is causing apprehension in southern Tunis. The condition of the wheat crop in Egypt is average.

Argentina.—The threshing of the wheat crop is practically completed. No recent estimates of production have been made but the present outlook indicates that the official estimate of 154,833,000 bushels will be exceeded. The quality of the grain is generally good. Fine weather continues to favour the corn crop.

Australia.—The preliminary estimate of the wheat crop harvested last December-January is 134,184,000 bushels against 144,400,000 last year. The revised estimates are expected to show some decrease but the quality of the grain is reported to be very good. Dry weather prevailed during the latter part of March.

New Zealand.—The total yield of wheat for 1921-22 is estimated at 10,500,000 bushels against 6,872,000 last year.

India.—The area sown to wheat for the crop just harvested is officially estimated at 28,012,000 acres compared with 25,722,000 last year. The five year average was 30,499,000 acres. The crop was harvested in good condition and under favourable circumstances.

China.—The new wheat crop of China will not be a large one. Some estimates place it as smaller than last year's small yield. It is expected that it will be necessary to import a considerable quantity of foreign wheat.

UNITED STATES APRIL CROP REPORT

Forecast of a production of 572,974,000 bushels of winter wheat, almost an average crop, was made as of April 1 by the Crop Reporting Board of the U.S. Department of Agriculture. Compared with this forecast is the estimated crop of 587,032,000 bushels in 1921, of 610,597,000 bushels in 1920, and the average of 578,575,000 bushels for the preceding 5 years.

The April forecast is based on the assumption of average abandonment on account of winterkilling of the area sown to winter wheat last fall, and average influences on the crop to time of harvest.

The acreage of the winter wheat crop of this year was estimated for last December 1 to be 44,293,000 acres subject to reduction by winterkilling and subject to revision up or down for other reasons. This acreage is 98·8 per cent of the winter wheat acreage of the preceding year.

A rye production of 69,667,000 bushels is indicated by the condition for April 1. This is above the production of 57,918,000 bushels in 1921 and of 60,490,000 in 1920. The average production of the preceding 5 years was 66,474,000 bushels.

Rye came through the winter better than the average, and its condition of 89 per cent of a normal on April 1 compares with a 10-year average of 88·5 per cent. In the States that are prominent in rye production the condition of the crop is above the average, except in Michigan, where it is the same as the average.

UNITED STATES WEEKLY WEATHER CROP BULLETIN, APRIL 19th

The weather was favourable for growth of vegetation in the Southern and Eastern States, where it advanced rapidly. The week was unusually cold and stormy in the Western States, and unfavourable for field work, growth of vegetation and for stock. Considerable frost damage occurred to fruit in California and the central and lower Rocky Mountain States. Field work made satisfactory progress in the South, but little was possible in central districts on account of saturated soil, and spring grain planting was seriously delayed in many localities. Continued excessive moisture is showing bad effects on winter wheat in some central and eastern portions of the belt, where there are complaints of yellowing on poorly drained soil. Progress of the crop in Oklahoma and Eastern Kansas was very good, but in north central and western Kansas the fields are weedy and stooling poorly. Preparation of corn land is badly delayed in central districts, while spring wheat seeding is progressing slowly and is behind the average.

EUROPEAN WHEAT REQUIREMENTS

(From Daily Trade Bulletin, Chicago, Apr. 18, 1922)

European wheat requirements until next harvest suggest the necessity of continued liberal buying. Reports yesterday said Greece will need 1,295,000 bushels monthly; Finland needs 800,000 bushels rye; the Baltic States in general are dependent largely upon American flour. Belgium is subsisting from hand to mouth on foreign grain purchases until the next crop. France requires 18,500,000 to 22,200,000 bushels of wheat. Roumania has suspended shipments of grain due France and Switzerland under contract. Italy has suspended the import duty on grain until June 30 and stocks of wheat in that country are estimated at 33,300,000 bushels, which are said to have deteriorated and are being distributed at $4.75 per quintal of 220 lbs., a price considerably below Argentine and American wheat, thus destroying the free market. Unless distribution of government stocks is suspended by reversal of the state policy the Italian wheat requirements during the next six months will be small.

LIVE STOCK STATISTICS

THE AUSTRIAN REPUBLIC

Classification	April, 1920	Dec. 1910	Increase(+)or decrease(−)	
			in number	per cent
Cattle	2,113,692	2,175,342	− 61,650	− 2·8
Swine	1,189·434	1,790,995	−601,561	−33·6
Sheep	368,361	278,482	+ 89,879	+32·3

GREECE

Classification	1920	1918	Increase(+) or decrease(−)	
			in number	per cent
Horses	200,802	185,768	+ 15,034	+ 8·1
Asses and mules	364,237	354,679	+ 9,558	+ 2·7
Cattle	659,398	649,229	+ 10,169	+ 1·6
Sheep	5,811,418	5,467,828	+343,590	+ 6·3
Goats	3,418,002	3,472,749	− 54,747	− 1·6
Swine	416,221	365,074	+ 51,147	+14·0
Poultry	5,073,479	4,452,782	+620,697	+13·9
Rabbits	460,661	337,370	+123,291	+36·5

ESTHONIA

Classification	1920	1919	Increase(+)or decrease(−)	
			in number	per cent
Horses	164,502	164,980	− 478	− 0·3
Cattle	442,668	406,569	+ 36,099	+ 8·9
Sheep	530,291	419,909	+110,382	+26·3
Swine	260,693	150,072	+110,620	+73·7

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